Expansion Card Product Technical Specification

AirLink FXT Series

SIERRA WIRELESS

WA_DEV_FEX20_PTS_004
001
June 30, 2010

Important Notice

Due to the nature of wireless communications, transmission and reception of data can never be guaranteed. Data may be delayed, corrupted (i.e., have errors) or be totally lost. Although significant delays or losses of data are rare when wireless devices such as the Sierra Wireless modem are used in a normal manner with a well-constructed network, the Sierra Wireless modem should not be used in situations where failure to transmit or receive data could result in damage of any kind to the user or any other party, including but not limited to personal injury, death, or loss of property. Sierra Wireless accepts no responsibility for damages of any kind resulting from delays or errors in data transmitted or received using the Sierra Wireless modem, or for failure of the Sierra Wireless modem to transmit or receive such data.

Safety and Hazards

Do not operate the Sierra Wireless modem in areas where blasting is in progress, where explosive atmospheres may be present, near medical equipment, near life support equipment, or any equipment which may be susceptible to any form of radio interference. In such areas, the Sierra Wireless modem **MUST BE POWERED OFF**. The Sierra Wireless modem can transmit signals that could interfere with this equipment. Do not operate the Sierra Wireless modem in any aircraft, whether the aircraft is on the ground or in flight. In aircraft, the Sierra Wireless modem **MUST BE POWERED OFF**. When operating, the Sierra Wireless modem can transmit signals that could interfere with various onboard systems.

Note: Some airlines may permit the use of cellular phones while the aircraft is on the ground and the door is open. Sierra Wireless modems may be used at this time.

The driver or operator of any vehicle should not operate the Sierra Wireless modem while in control of a vehicle. Doing so will detract from the driver or operator's control and operation of that vehicle. In some states and provinces, operating such communications devices while in control of a vehicle is an offence.

Limitations of Liability

This manual is provided "as is". Sierra Wireless makes no warranties of any kind, either expressed or implied, including any implied warranties of merchantability, fitness for a particular purpose, or noninfringement. The recipient of the manual shall endorse all risks arising from its use.

The information in this manual is subject to change without notice and does not represent a commitment on the part of Sierra Wireless. SIERRA WIRELESS AND ITS AFFILIATES SPECIFICALLY DISCLAIM LIABILITY FOR ANY AND ALL DIRECT, INDIRECT, SPECIAL, GENERAL, INCIDENTAL, CONSEQUENTIAL, PUNITIVE OR EXEMPLARY DAMAGES INCLUDING, BUT NOT LIMITED TO, LOSS OF PROFITS OR REVENUE OR ANTICIPATED PROFITS OR REVENUE ARISING OUT OF THE USE OR INABILITY TO USE ANY SIERRA WIRELESS PRODUCT, EVEN IF SIERRA WIRELESS AND/OR ITS AFFILIATES HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES OR THEY ARE FORESEEABLE OR FOR CLAIMS BY ANY THIRD PARTY.

Notwithstanding the foregoing, in no event shall Sierra Wireless and/or its affiliates aggregate liability arising under or in connection with the Sierra Wireless product, regardless of the number of events, occurrences, or claims giving rise to liability, be in excess of the price paid by the purchaser for the Sierra Wireless product.

Patents

Portions of this product may be covered by some or all of the following US patents:

5,515,013	5,629,960	5,845,216	5,847,553	5,878,234	5,890,057	5,929,815	6,169,884
6,191,741	6,199,168	6,339,405	6,359,591	6,400,336	6,516,204	6,561,851	6,643,501
6,653,979	6,697,030	6,785,830	6,845,249	6,847,830	6,876,697	6,879,585	6,886,049
6,968,171	6,985,757	7,023,878	7,053,843	7,106,569	7,145,267	7,200,512	7,295,171
7,287,162	D442,170	D459,303	D599,256	D560,911			

and other patents pending.

This product includes technology licensed from QUALCOMM® 3G

Manufactured or sold by Sierra Wireless or its licensees under one or more patents licensed from InterDigital Group.

Copyright

© 2010 Sierra Wireless. All rights reserved.

Trademarks

AirCard® and Watcher® are registered trademarks of Sierra Wireless. Sierra Wireless™, AirPrime™, AirLink™, AirVantage™ and the Sierra Wireless logo are trademarks of Sierra Wireless.

wavecom®, , , ®, inSIM®, WAVECOM®, WISMO®, Wireless Microprocessor®, Wireless CPU®, Open AT® are filed or registered trademarks of Sierra Wireless S.A. in France and/or in other countries.

Windows® and Windows Vista® are registered trademarks of Microsoft Corporation.

Macintosh and Mac OS are registered trademarks of Apple Inc., registered in the U.S. and other countries.

QUALCOMM® is a registered trademark of QUALCOMM Incorporated. Used under license.

Other trademarks are the property of the respective owners.

Contact Information

Sales Desk:	Phone:	1-604-232-1488
	Hours:	8:00 AM to 5:00 PM Pacific Time
	E-mail:	sales@sierrawireless.com
Post:	Sierra Wireless 13811 Wireless Way Richmond, BC Canada V6V 3A4	
Fax:	1-604-231-1109	
Web:	www.sierrawireless.com	

Consult our website for up-to-date product descriptions, documentation, application notes, firmware upgrades, troubleshooting tips, and press releases: www.sierrawireless.com

Document History

Version	Date	Updates
001	June 30, 2010	Creation

Contents

1. OVERVIEW 11
   1.1. Expansion Card Features 11
   1.2. Operating System 11
   1.3. Connection Interfaces 11
   1.4. Environmental Compliance 12
      1.4.1. RoHS Directive Compliant 12
      1.4.2. Disposing of the Product 12
2. FUNCTIONAL SPECIFICATIONS 13
   2.1. Operating System 13
3. TECHNICAL SPECIFICATIONS 14
   3.1. Power Supply 14
   3.2. Mechanical Specifications 15
      3.2.1. Expansion Card Mechanical Drawing 15
      3.2.2. Expansion Card Design Suggestion 16
      3.2.3. Mechanical Integration 17
4. INTERFACES 18
   4.1. General Purpose Connector 18
      4.1.1. Pin Description 19
   4.2. Electrical Information for Digital I/O 22
   4.3. General Purpose Input/Output 23
   4.4. Serial Interface 24
      4.4.1. SPI Bus 24
         4.4.1.1. Characteristics 24
         4.4.1.2. Configuration 24
         4.4.1.3. Pin Description 24
         4.4.1.4. Waveforms 25
      4.4.2. I^2C Bus 26
         4.4.2.1. Pin Description 26
         4.4.2.2. Waveforms 26
   4.5. Auxiliary Serial Link (UART2) 27
      4.5.1. Pin Description 27
   4.6. RF Interface 27
      4.6.1. External Active Antenna Specifications 27
   4.7. Digital Audio Interface (PCM) 28
      4.7.1. Waveforms 28
      4.7.2. Pin Description 30
5. SIGNALS AND INDICATORS 31
   5.1. Reset Signal (~RESET) 31
      5.1.1. Reset Sequence 31
      5.1.2. Pin Description 31
      5.1.3. Electrical Characteristics 32

5.2. BOOT Signal 32
5.2.1. Pin Description 33
5.3. External Interrupt 33
5.3.1. Pin Description 33
5.3.2. Electrical Characteristics 33
5.4. GSM-2V8 and GSM-1V8 Output 34
5.4.1. Pin Description 34
5.4.2. Electrical Characteristics 34
5.5. Analog to Digital Converter 34
5.5.1. Pin Description 34
5.5.2. Electrical Characteristics 34
5.6. Digital to Analog Converter 35
5.6.1. Pin Description 35
5.6.2. Electrical Characteristics 35

6. RELIABILITY COMPLIANCE AND RECOMMENDED STANDARDS 36

6.1. Reliability Compliance 36
6.2. Applicable Standards Listing 36
6.3. Environmental Specifications 37
6.3.1. Function Status Classification 37
6.3.2. Reliability Prediction Model 38
6.3.2.1. Life Stress Test 38
6.3.2.2. Environmental Resistance Stress Test 38
6.3.2.3. Corrosive Resistance Stress Test 39
6.3.2.4. Thermal Resistance Cycle Stress Test 40
6.3.2.5. Mechanical Resistance Stress Tests 40
6.3.2.6. Handling Resistance Stress Tests 42

7. CERTIFICATION COMPLIANCE AND RECOMMENDED STANDARDS 43

7.1. Certification Compliance 43
7.2. Applicable Standards Listing 43

8. DESIGN GUIDELINES 45

8.1. EMC Recommendations 45

9. CONNECTOR AND PERIPHERAL DEVICE REFERENCES 46

9.1. General Purpose Connector 46

10. REFERENCE DOCUMENTS 47

10.1. Fastrack Xtend and Expansion Card Documents 47
10.2. Sierra Wireless Software Suite Documents 47
10.3. Firmware Documents 47
10.4. Plug-In Documents 48
10.5. General Reference Documents 48

11. LIST OF ABBREVIATIONS 49

12. SAFETY RECOMMENDATIONS (FOR INFORMATION ONLY) 52

12.1. RF Safety 52
12.1.1. General 52
12.1.2. Exposure to RF Energy 52
12.1.3. Efficient Terminal Operation 52
12.1.4. Antenna Care and Replacement 52
12.2. General Safety 53
12.2.1. Driving 53
12.2.2. Electronic Devices 53
12.2.3. Vehicle Electronic Equipment 53
12.2.4. Medical Electronic Equipment 53
12.2.5. Aircraft 53
12.2.6. Children 54
12.2.7. Blasting Areas 54
12.2.8. Potentially Explosive Atmospheres 54
13. APPENDIX 55
13.1. Backplate Reference 55
13.2. Extraction Tool Reference 58

List of Figures

Figure 1. Signals Available on the 50-pin Expansion Card Connector 13
Figure 2. Expansion Card Mechanical Drawing 15
Figure 3. Suggested Expansion Card Dimension 16
Figure 4. Mechanical Integration 17
Figure 5. SPI Timing Diagram (Mode 0, Master, 4 wires) 25
Figure 6. I^2C Timing Diagram (Master) 26
Figure 7. PCM Frame Waveform 29
Figure 8. PCM Sampling Waveform 29
Figure 9. Reset Sequence Waveform 31
Figure 10. WM24097 Backplate Mechanical Drawing 56
Figure 11. WM24562 Backplate Mechanical Drawing 57
Figure 12. Extraction Tool Mechanical Specifications 59

List of Tables

Table 1: Power Supplies Pin Description 14
Table 2: VCC-2V8 Supply Signal 14
Table 3: 4V Supply Signal 14
Table 4: DC-IN Supply Signal 14
Table 5: Available Interfaces on the GPC 18
Table 6: General Purpose Connector Pin Description 19
Table 7: Electrical Characteristics of a 2.8 volt Type Digital I/O 22
Table 8: Electrical Characteristics of a 1.8 volt Type Digital I/O 22
Table 9: Open Drain Output Type 22
Table 10: Reset State Definition 23
Table 11: GPIO Pin Description 23
Table 12: SPI Bus Configuration 24
Table 13: SPI1 Bus Pin Description 24
Table 14: SPI2 Bus Pin Description 25
Table 15: SPI Bus AC Characteristics 25
Table 16: I^2C Bus Pin Description 26
Table 17: I^2C Bus AC Characteristics 26
Table 18: UART2 Pin Description 27
Table 19: External Antenna Characteristics 28
Table 20: PCM AC Characteristics 30
Table 21: PCM Pin Description 30
Table 22: Reset Signal Pin Description 32
Table 23: Electrical Characteristics of the Reset Signal 32
Table 24: BOOT Settings 32
Table 25: Boot Signal Pin Description 33
Table 26: External Interrupt Pin Description 33
Table 27: Electrical Characteristics of the External Interrupt 33
Table 28: GSM-2V8 and GSM-1V8 Output Pin Description 34
Table 29: Electrical Characteristics of GSM-2V8 and GSM-1V8 Output 34
Table 30: Analog to Digital Pin Description 34
Table 31: Electrical Characteristics of the Analog to Digital Converter 35
Table 32: Digital to Analog Pin Description 35
Table 33: Electrical Characteristics of the Digital to Analog Converter 35
Table 34: Standards Conformity for the Fastrack Xtend Series 36
Table 35: Applicable Standards and Requirements for the Fastrack Xtend 36
Table 36: Operating Class Temperature Range without an Expansion Card 37
Table 37: ISO Failure Mode Severity Classification 38

Table 38: Life Stress Test 38
Table 39: Environmental Resistance Stress Test 39
Table 40: Corrosive Resistance Stress Test 39
Table 41: Thermal Resistance Cycle Stress Test 40
Table 42: Mechanical Resistance Stress Tests 40
Table 43: Handling Resistance Stress Tests 42
Table 44: Standards Conformity for the Fastrack Xtend Series 43
Table 45: Applicable Standards and Requirements for the Fastrack Xtend Series 43
Table 46: Available Backplates 55

1. Overview

The Expansion Card is a device that expands the functionality of a standard Fastrack Xtend programmable gateway into a state of the art device for machine to machine applications. With the Expansion Card, it is possible to utilize the Internal Expansion Socket (IES) which allows the Fastrack Xtend to have a bigger application potential.

The Fastrack Xtend with an Expansion Card plugged-in may utilize one or more Plug-Ins of the Sierra Wireless Software Suite. The Sierra Wireless Software Suite is the world's most comprehensive cellular development environment, which allows embedded standard ANSI C applications to be natively executed directly on intelligent embedded modules.

1.1. Expansion Card Features

- 1 – Secondary Serial Link (UART2)
- 6 – GPIOs
- 2 – SPI Bus
- 1 – ADC
- 1 – DAC
- 1 – PCM
- 1 – DTR
- 1 – Interrupt
- Reset access to the embedded module
- Boot access to the embedded module
- 2.8V supply from the Fastrack Xtend
- 4V supply from the Fastrack Xtend
- 2.8V Digital supply from the embedded module
- 1.8V Digital supply from the embedded module
- Access to 4.75 to 32V DC-IN

1.2. Operating System

- Sierra Wireless Software Suite 2.31 or above
  - Open AT® OS 6.31 or above

1.3. Connection Interfaces

- 50-pin Expansion Card Connector

1.4. Environmental Compliance

In order for the Fastrack Xtend to be fully RoHS Compliant, the add-on Expansion Card must also be RoHS Compliant.

1.4.1. RoHS Directive Compliant

The Fastrack Xtend is compliant with RoHS Directive 2002/95/EC which sets limits for the use of certain restricted hazardous substances. This directive states that “from 1st July 2006, new electrical and electronic equipment put on the market does not contain lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls (PBB) or polybrominated diphenyl ethers (PBDE)”.

1.4.2. Disposing of the Product

This electronic product is subject to the EU Directive 2002/96/EC for Waste Electrical and Electronic Equipment (WEEE). As such, this product must not be disposed off at a municipal waste collection point. Please refer to local regulations for directions on how to dispose of this product in an environmental friendly manner.

2. Functional Specifications

An example of a global architecture of the Expansion Card is described in the figure below.

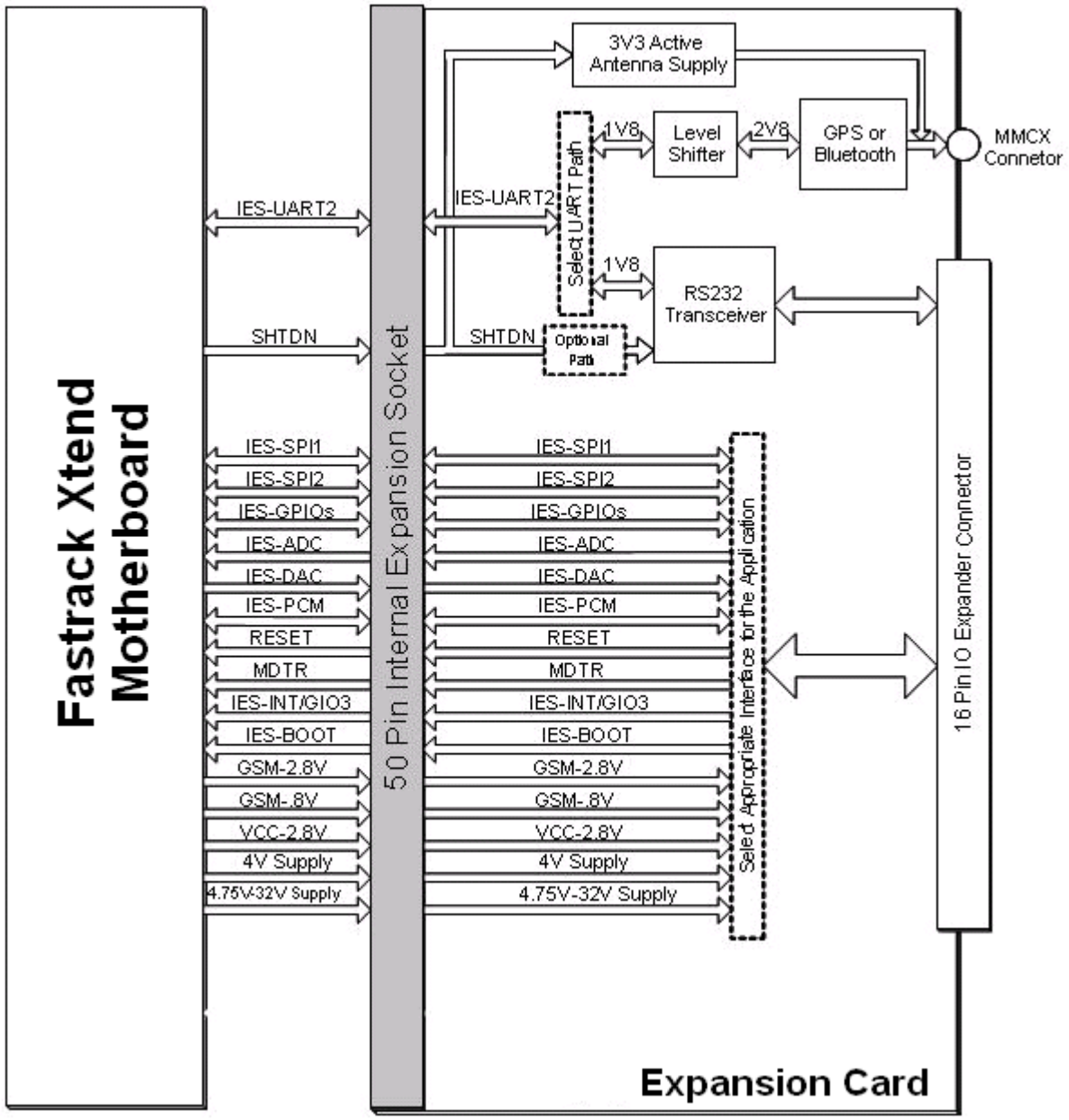


Figure 1. Signals Available on the 50-pin Expansion Card Connector

Note: References in the figure above to an MMCX connector and an IO expander connector are used as examples only.

2.1. Operating System

The Expansion Card is designed to integrate with the Fastrack Xtend which is Sierra Wireless Software Suite compliant. With the Sierra Wireless Software Suite, customers can embed their own applications with the Fastrack Xtend and Expansion Card and turn the Fastrack Xtend into a solution for their specific market need.

3. Technical Specifications

3.1. Power Supply

The Expansion Card power supplies are readily available on the 50-pin connector.

The following table describes the pin description of the available power supplies from the 50-pin connector.

Table 1: Power Supplies Pin Description

Pin Number(s)	Signal	I/O Type	Description
41	VCC-2V8	Supply	LDO
46, 47	4V	Supply	High current power supply.
43, 44	DC-IN IESM	Supply	High current external power supply. The same supply provided on the 10-pin Micro-Fit connector with polarity protection.

The following tables describe the electrical characteristics of each DC supply signal.

Table 2: VCC-2V8 Supply Signal

Parameter		Minimum	Typical	Maximum	Unit
VCC-2V8	Output voltage	2.73	2.8	2.87	V
	Output Current	-	-	100	mA

Table 3: 4V Supply Signal

Parameter		Minimum	Typical	Maximum	Unit
4V	Output voltage	3.91	4	4.12	V
	Output Current	-	-	300	mA

Table 4: DC-IN Supply Signal

Parameter		Minimum	Typical	Maximum	Unit
DC-IN	Output voltage	5.5	13.2	32	V
	Output Current	218	91	37.5	mA

Warning: *The total maximum power dissipation of these three power supplies must not exceed 1.2W.*

3.2. Mechanical Specifications

3.2.1. Expansion Card Mechanical Drawing

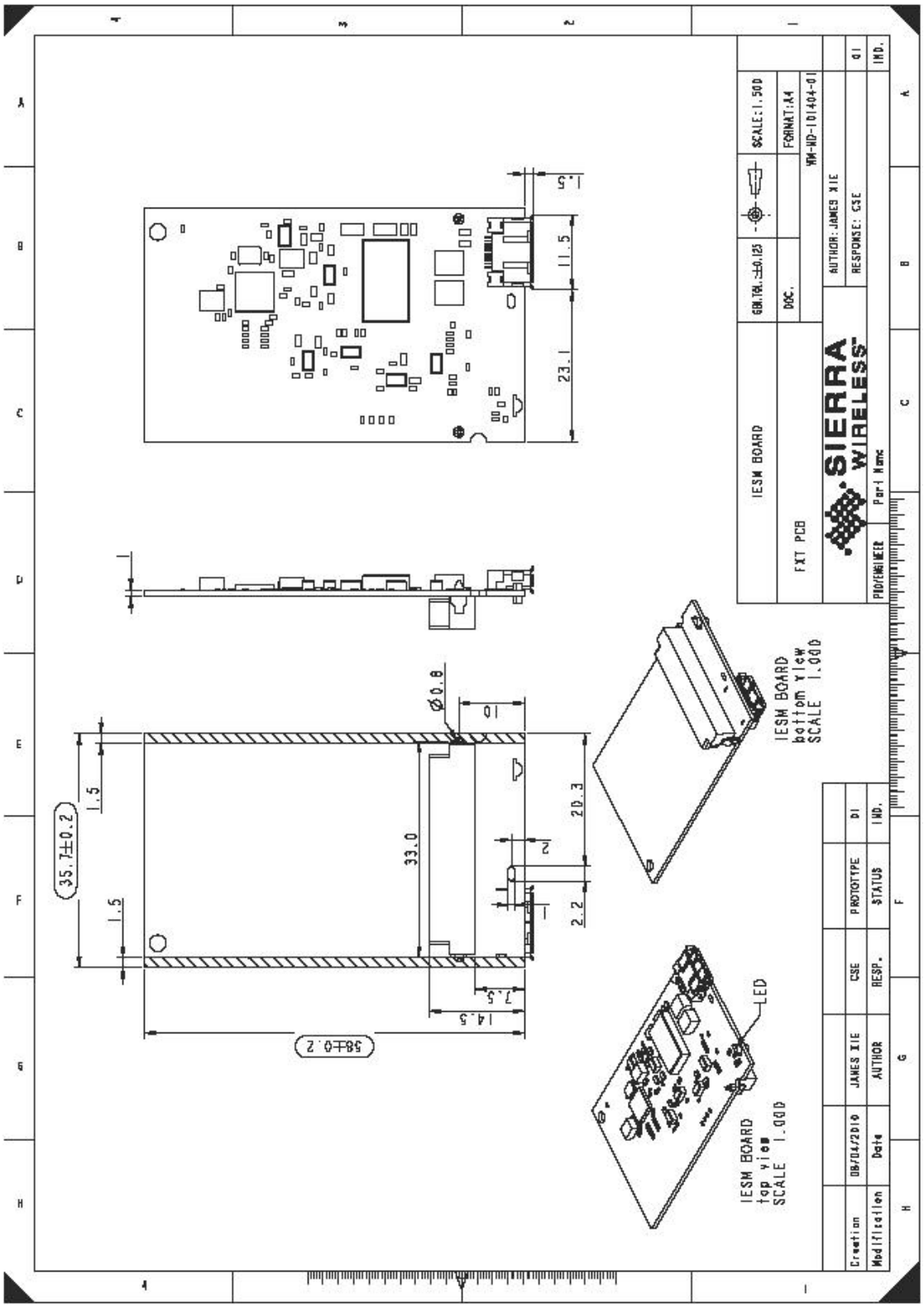


Figure 2. Expansion Card Mechanical Drawing

3.2.2. Expansion Card Design Suggestion

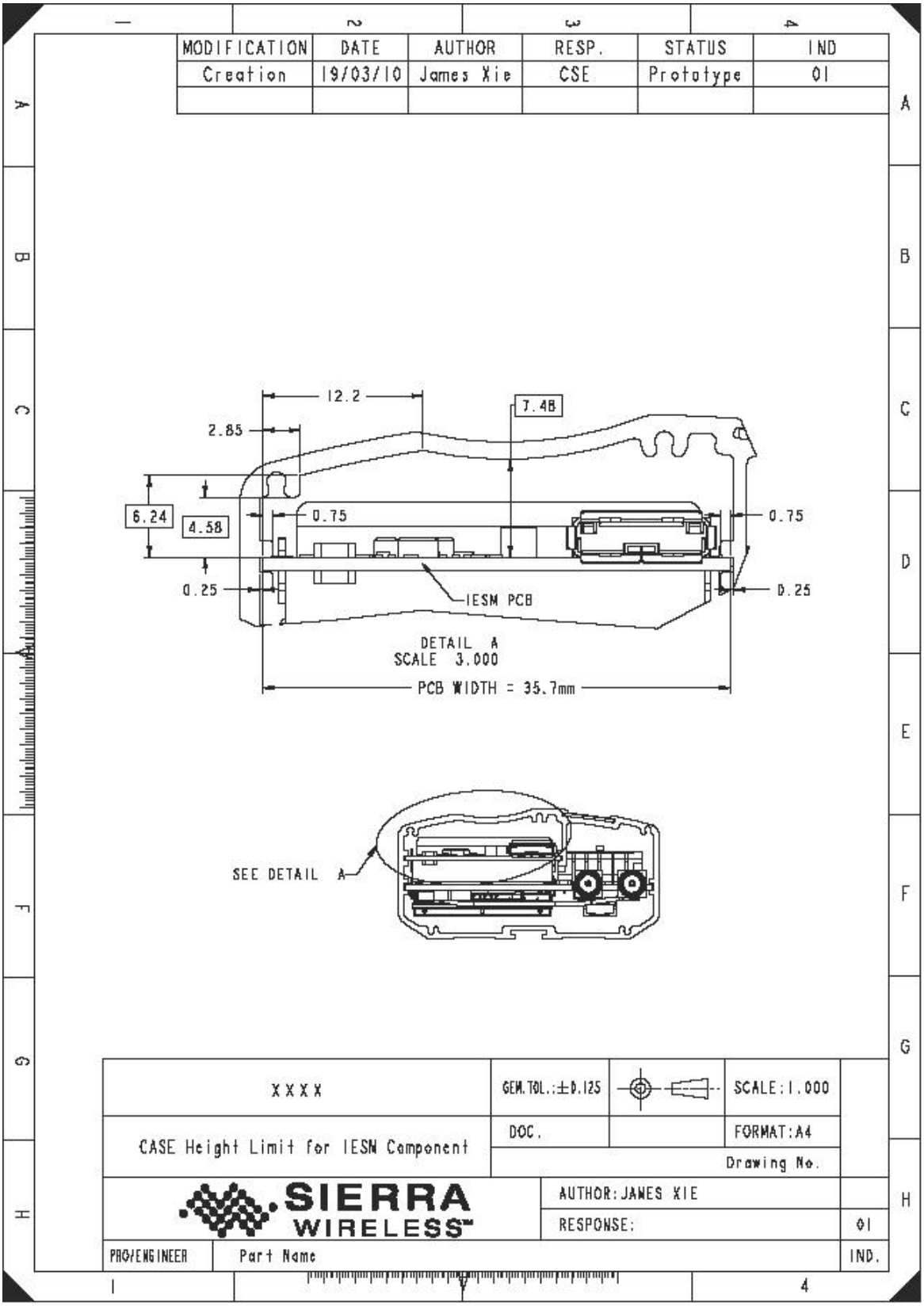


Figure 3. Suggested Expansion Card Dimension

3.2.3. Mechanical Integration

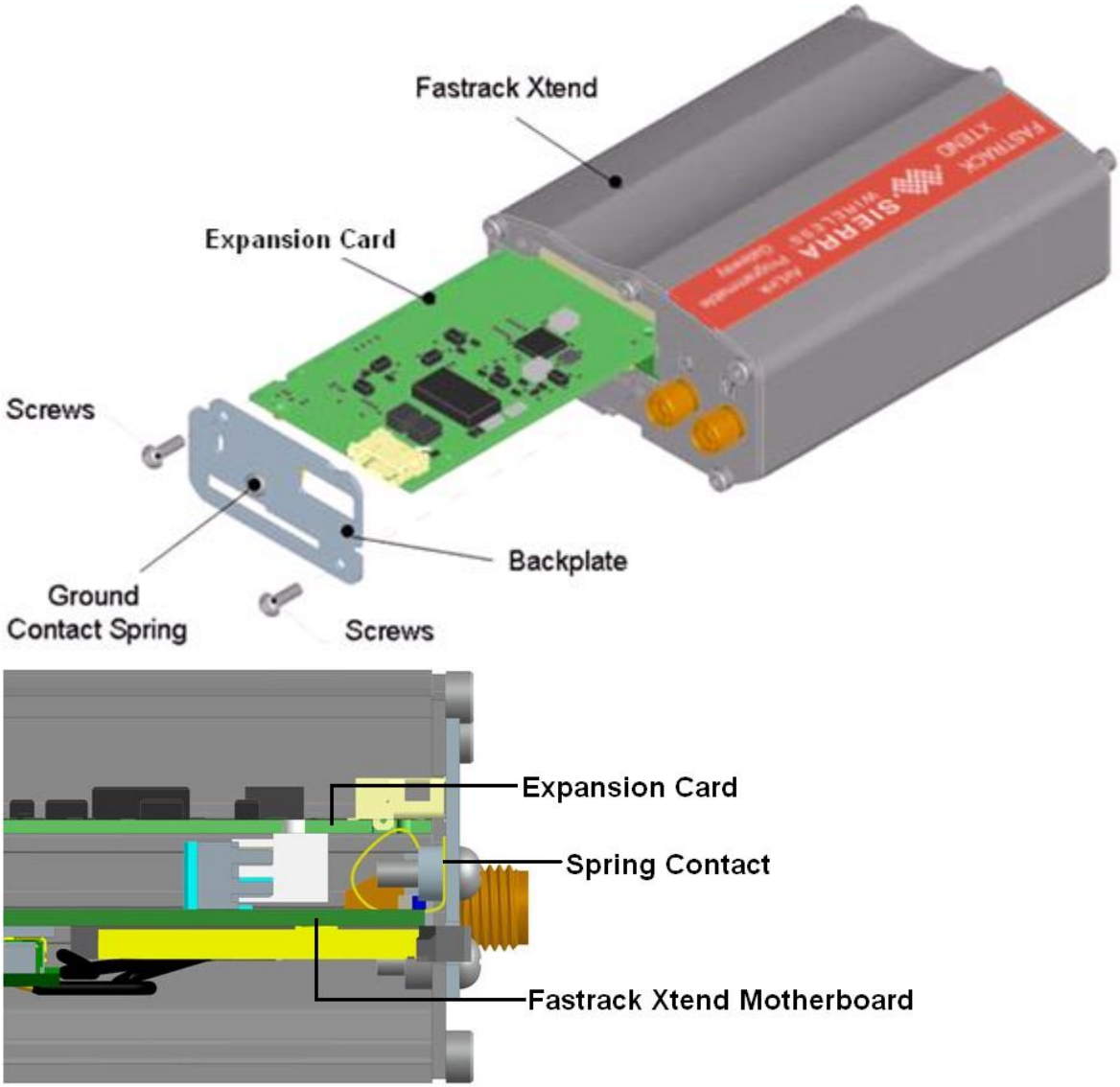


Figure 4. Mechanical Integration

Tip:	*The best grounding for the expansion card is utilized by using a ground spring contact that attaches to the middle screw of the back plate.*

4. Interfaces

4.1. General Purpose Connector

The Expansion Card has a 50-pin expansion card connector. The high-density 50-pin Expansion Card Connector is used for interfacing the Expansion Card with the Fastrack Xtend motherboard.

The interfaces available on the GPC are listed in the following table.

Table 5: Available Interfaces on the GPC

Sub-section	Interface	Driven by AT Commands	Driven by the Sierra Wireless Software Suite
4.4	Serial Interface		✓
4.5	Auxiliary Serial Link (UART2)	✓	✓
4.3	General Purpose Input/Output	✓	✓
5.5	Analog to Digital Converter	✓	✓
5.6	Digital to Analog Converter		✓
5.3	External Interrupt	✓	✓
4.7	Digital Audio Interface (PCM)	✓	✓

4.1.1. Pin Description

Table 6: General Purpose Connector Pin Description

Pin Number	Signal Name		Voltage	I/O*	Reset State	Description	Dealing with Unused Pins
	Nominal	Multiplexed with					
1	GND						
2	GND						
3	Reserved						
4	Reserved						
5	Reserved						
6	Reserved						
7	NC						
8	NC						
9	NC						
10	1.8V Digital supply from the embedded module		1V8	O		1.8V Supply Output	NC
11	2.8V Digital supply from the embedded module		2V8	O		2.8V Supply Output	NC
12	BOOT		1V8	I		Boot Input	NC
13	RESET		1V8	I/O		RESET Input	NC
14	AUX-ADC		Analog	I		Analog to Digital Input	NC or Pull to GND
15	SPI1-CS	GPIO31	2V8	O	Z	SPI1 Chip Select	NC
16	SPI1-CLK	GPIO28	2V8	O	Z	SPI1 Clock	NC
17	SPI1-I	GPIO30	2V8	I	Z	SPI1 Data Input	NC
18	SPI1-IO	GPIO29	2V8	I/O	Z	SPI1 Data Input / Output	NC
19	SPI2-CLK	GPIO32	2V8	O	Z	SPI2 Clock	NC
20	SPI2-IO	GPIO33	2V8	I/O	Z	SPI2 Data Input / Output	NC

Pin Number	Signal Name		Voltage	I/O*	Reset State	Description	Dealing with Unused Pins
21	SPI2-CS	GPIO35	2V8	O	Z	SPI2 Chip Select	NC
22	SPI2-I	GPIO34	2V8	I	Z	SPI2 Data Input	NC
23	RXD2	GPIO15	1V8	O	Z	Auxiliary RS232 Receive	Add a test point for debugging
24	TXD2	GPIO14	1V8	I	Z	Auxiliary RS232 Transmit	(TXD2) Pull-up to VCC_1V8 with 100kΩ and add a test point for debugging
25	CTS2	GPIO16	1V8	O	Z	Auxiliary RS232 Clear To Send	(CTS2) Add a test point for debugging
26	RTS2	GPIO17	1V8	I	Z	Auxiliary RS232 Request To Send	(RTS2) Pull-up to VCC_1V8 with 100kΩ and add a test point for debugging
27	GPIO8		1V8	I/O	Pull-up		NC
28	GPIO26	SCL	Open Drain	O	Z	I²C Clock	NC
29	GPIO19		2V8	I/O	Z		NC
30	GPIO27	SDA	Open Drain	I/O	Z	I²C Data	NC
31	GPIO20		2V8	I/O	Undefined		NC
32	INT0	GPIO3	1V8	I	Z	Interruption 0 Input	If INT0 is not used, it should be configured as GPIO
33	GPIO23	*	2V8	I/O	Z		NC
34	GPIO22	*	2V8	I/O	Z		NC
35	DTR1-CT108/2	GPIO41	2V8	I	Z	Main RS232 Data Terminal Ready	(DTR1) Pull-up to VCC_2V8 with 100kΩ
36	PCM-SYNC		1V8	O	Pull-down	PCM Frame Synchro	NC
37	PCM-IN		1V8	I	Pull-up	PCM Data Input	NC
38	PCM-CLK		1V8	O	Pull-down	PCM Clock	NC
39	PCM-OUT		1V8	O	Pull-up	PCM Data Output	NC
40	AUX-DAC		Analog	O		Digital to Analog Output	NC

Pin Number	Signal Name		Voltage	I/O*	Reset State	Description	Dealing with Unused Pins
41	2.8V supply from the Fastrack Xtend		2V8	O		Power Supply	
42	GND		GND			GND	
43	DC-IN IESM		4.75V – 32V	O		Power Supply	
44	DC-IN IESM		4.75V – 32V	O		Power Supply	
45	GND		GND			GND	
46	4V supply from the Fastrack Xtend		4V	O		Power Supply	
47	4V supply from the Fastrack Xtend		4V	O		Power Supply	
48	GND		GND			GND	
49	GND		GND			GND	
50	GND		GND			GND	

* For more information about the multiplexing of these signals, refer to section 4.3 General Purpose Input/Output.

4.2. Electrical Information for Digital I/O

There are three types of digital I/Os on the Expansion Card:

- 2.8 volt CMOS
- 1.8 volt CMOS
- Open drain

Refer to the tables below for the electrical characteristics of these digital I/Os.

Table 7: Electrical Characteristics of a 2.8 volt Type Digital I/O

Parameter		I/O Type	Minimum	Typical	Maximum	Condition
Internal 2.8V power supply		VCC_2V8	2.74V	2.8V	2.86V	
Input/Output pin	V_{IL}	CMOS	-0.5V*		0.84V	
	V_{IH}	CMOS	1.96V		3.2V*	
	V_{OL}	CMOS			0.4V	I_{OL} = - 4 mA
	V_{OH}	CMOS	2.4V			I_{OH} = 4 mA
	I_{OH}				4mA	
	I_{OL}				- 4mA	

* Absolute maximum ratings

All 2.8V I/O pins do not accept input signal voltages above the maximum voltage specified above.

Table 8: Electrical Characteristics of a 1.8 volt Type Digital I/O

Parameter		I/O Type	Minimum	Typical	Maximum	Condition
Internal 1.8V power supply		VCC_1V8	1.76V	1.8V	1.94V	
Input/Output pin	V_{IL}	CMOS	-0.5V*	0.54V		
	V_{IH}	CMOS	1.33V	2.2V*		
	V_{OL}	CMOS		0.4V		I_{OL} = - 4 mA
	V_{OH}	CMOS	1.4V			I_{OH} = 4 mA
	I_{OH}			4mA		
	I_{OL}			- 4mA		

* Absolute maximum ratings

Table 9: Open Drain Output Type

Signal Name	Parameter	I/O Type	Minimum	Typical	Maximum	Condition
SDA/GPIO27 and SCL/GPIO26	V_{TOL}	Open Drain			3.3V	Tolerated voltage
	V_{IH}	Open Drain	2V			
	V_{IL}	Open Drain			0.8V	
	V_{OL}	Open Drain			0.4V	
	I_{OL}	Open Drain			3mA	

The reset states of the I/Os are given in each interface description chapter. Definitions of these states are given in the table below.

Table 10: Reset State Definition

Parameter	Definition
0	Set to GND
1	Set to supply 1V8 or 2V8 depending on I/O type
Pull-down	Internal pull-down with ~60K resistor.
Pull-up	Internal pull-up with ~60K resistor to supply 1V8 or 2V8 depending on I/O type.
Z	High impedance
Undefined	**Caution:** *Undefined must not be used in an application if a special state is required at reset. These pins may be a toggling a signal(s) during reset.*

4.3. General Purpose Input/Output

The Expansion Card provides a total of 20 General Purpose I/O. These can be used to control any external device such as GPS, Bluetooth, LCD or any other external application.

Note that these GPIOs are only available if the multiplexed counterparts aren't used.

Refer to the table below for the pin description of the GPIO.

Table 11: GPIO Pin Description

Pin Number	Signal	I/O	I/O Type	Reset State	Multiplexed With
32	GPIO3	I/O	1V8	Z	INT0
27	GPIO8	I/O	1V8	Pull-up	Not mux
24	GPIO14	I/O	1V8	Z	CT103 / TXD2
23	GPIO15	I/O	1V8	Z	CT104 / RXD2
25	GPIO16	I/O	1V8	Z	~CT106 / CTS2
26	GPIO17	I/O	1V8	Z	~CT105 / RTS2
29	GPIO19	I/O	2V8	Z	Not mux
31	GPIO20	I/O	2V8	Undefined	Not mux
34	GPIO22	I/O	2V8	Z	Not mux*
33	GPIO23	I/O	2V8	Z	Not mux*
28	GPIO26	I/O	Open Drain	Z	SCL
30	GPIO27	I/O	Open Drain	Z	SDA
16	GPIO28	I/O	2V8	Z	SPI1-CLK
18	GPIO29	I/O	2V8	Z	SPI1-IO
17	GPIO30	I/O	2V8	Z	SP1-I
15	GPIO31	I/O	2V8	Z	~SPI1-CS
19	GPIO32	I/O	2V8	Z	SPI2-CLK
20	GPIO33	I/O	2V8	Z	SPI2-IO
22	GPIO34	I/O	2V8	Z	SP2-I
21	GPIO35	I/O	2V8	Z	~SPI2-CS
35	GPIO41	I/O	2V8	Z	~CT108-2 / DTR1

* If a Bluetooth module is used, these GPIOs must be reserved.

Refer to section 4.2 Electrical Information for Digital I/O for open drain, 2V8 and 1V8 voltage characteristics and reset state definitions.

4.4. Serial Interface

The Expansion Card may be connected to an LCD driver through either of the two SPI bus interface.

4.4.1. SPI Bus

Both SPI bus interface includes:

- a CLK signal
- an I/O signal
- an I signal
- a CS signal complying with the standard SPI bus

4.4.1.1. Characteristics

The following lists the features available on the SPI bus:

- Master mode operation
- SPI speed is from 101.5 Kbit/s to 13 Mbit/s in master mode operation
- 3 or 4-wire interface
- SPI-mode configuration: 0 to 3
- 1 to 16 bits data length

4.4.1.2. Configuration

Table 12: SPI Bus Configuration

Operation	Maximum Speed	SPI-Mode	Duplex	3-wire Type	4-wire Type
Master	13 Mb/s	0,1,2,3	Half	SPIx-CLK; SPIx-IO; ~SPIx-CS	SPIx-CLK; SPIx-IO; SPIx-I; ~SPIx-CS

Note that for the 4-wire configuration, SPIx-I/O is used as output only; and SPIx-I is used as input only. For the 3-wire configuration, SPIx-I/O is used as both input and output.

4.4.1.3. Pin Description

Refer to the following tables for the pin description of both SPI bus interface.

Table 13: SPI1 Bus Pin Description

Pin Number	Signal	I/O	I/O Type	Reset State	Description	Multiplexed With
16	SPI1-CLK	O	2V8	Z	SPI Serial Clock	GPIO28
18	SPI1-IO	I/O	2V8	Z	SPI Serial input/output	GPIO29
17	SPI1-I	I	2V8	Z	SPI Serial input	GPIO30
15	~SPI1-CS	O	2V8	Z	SPI Enable	GPIO31

Refer to section 4.2 Electrical Information for Digital I/O for open drain, 2V8 and 1V8 voltage characteristics and reset state definitions.

Table 14: SPI2 Bus Pin Description

Pin Number	Signal	I/O	I/O Type	Reset State	Description	Multiplexed With
19	SPI2-CLK	O	2V8	Z	SPI Serial Clock	GPIO32
20	SPI2-IO	I/O	2V8	Z	SPI Serial input/output	GPIO33
22	SP2-I	I	2V8	Z	SPI Serial input	GPIO34
21	~SPI2-CS	O	2V8	Z	SPI Enable	GPIO35

Refer to section 4.2 Electrical Information for Digital I/O for open drain, 2V8 and 1V8 voltage characteristics and reset state definitions.

4.4.1.4. Waveforms

The figure below shows the waveforms for SPI transfers with a 4-wire configuration in master mode 0 (chip select is not represented).

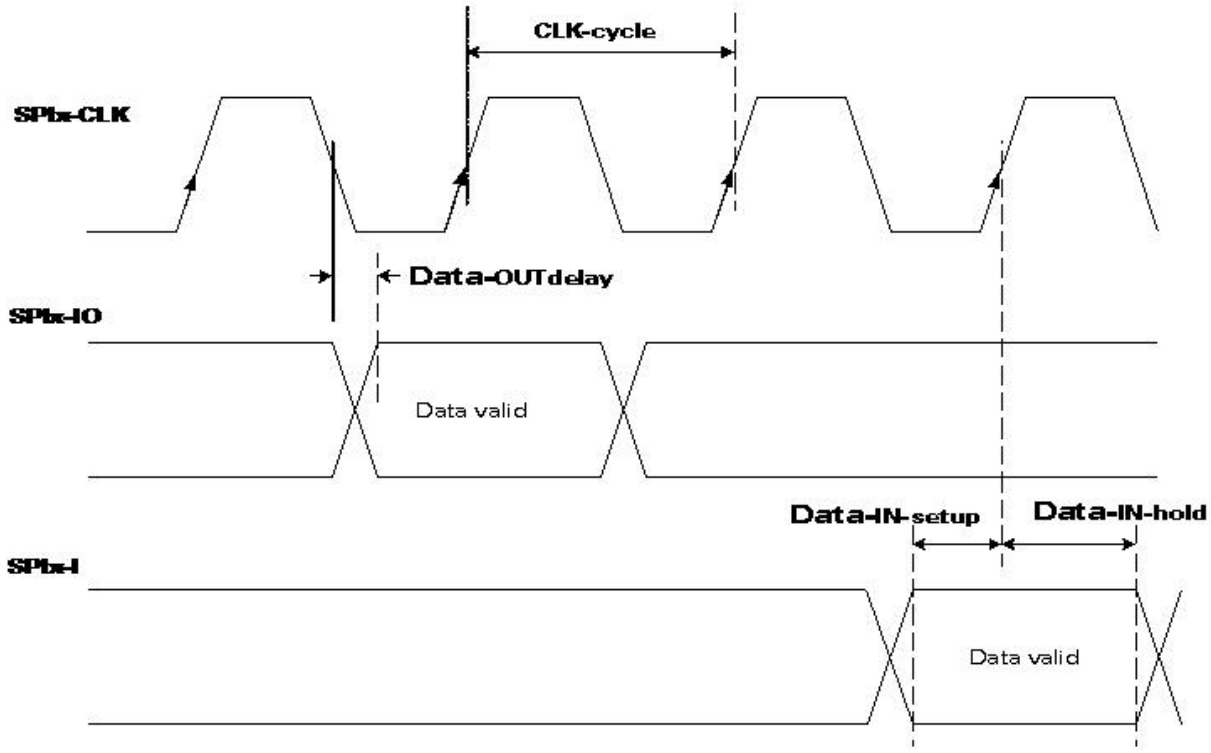


Figure 5. SPI Timing Diagram (Mode 0, Master, 4 wires)

Table 15: SPI Bus AC Characteristics

Signal	Description	Minimum	Typical	Maximum	Unit
CLK-cycle	SPI clock frequency	0.1015		13	MHz
Data-OUT delay	Data-OUT ready delay time			10	ns
Data-IN-setup	Data-IN setup time	2			ns
Data-OUT-hold	Data-OUT hold time	2			ns

4.4.2. I²C Bus

The I²C interface includes a clock signal (SCL) and a data signal (SDA) which complies with 100Kbit/s–standard interface (standard mode: s-mode).

The I²C bus is always in master mode operation.

The maximum speed transfer is 400Kbit/s (fast mode: f-mode).

For more information on the I²C bus, see document [17] "I2C Bus Specification", Version 2.0, Philips Semiconductor 1998.

4.4.2.1. Pin Description

Table 16: I²C Bus Pin Description

Pin Number	Signal	I/O	I/O Type	Reset State	Description	Multiplexed With
28	SCL	O	Open drain	Z	Serial Clock	GPIO26
30	SDA	I/O	Open drain	Z	Serial Data	GPIO27

Refer to section 4.2 Electrical Information for Digital I/O for open drain, 2V8 and 1V8 voltage characteristics and reset state definitions.

4.4.2.2. Waveforms

The figure below shows the I²C bus waveforms in master mode configuration.

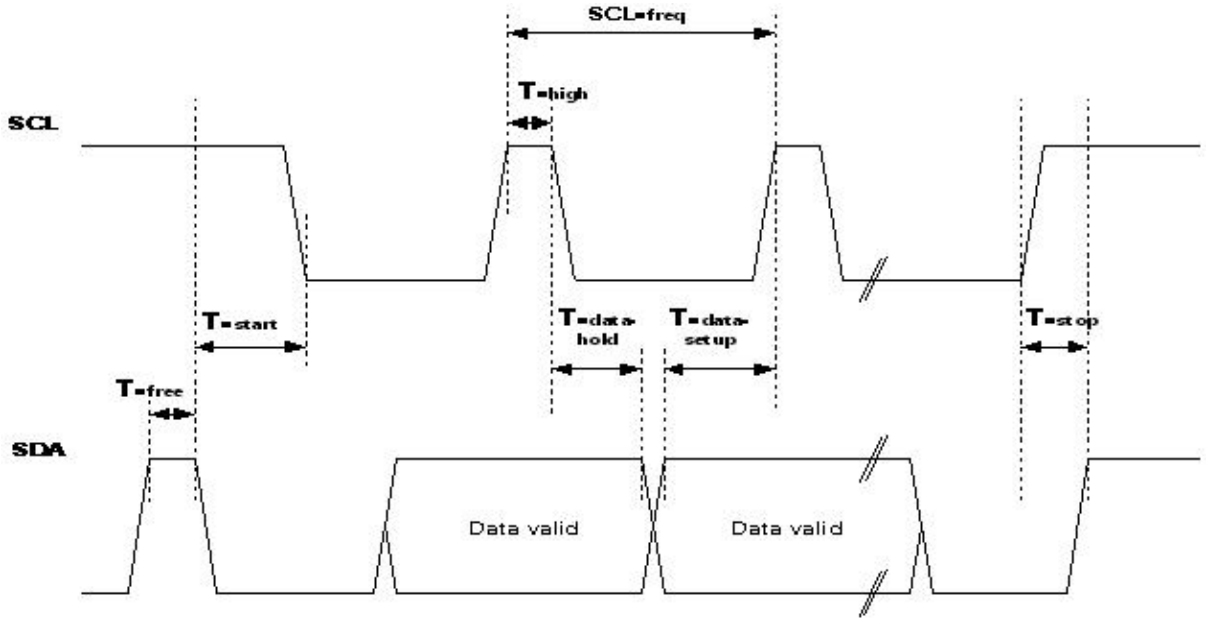


Figure 6. I²C Timing Diagram (Master)

Table 17: I²C Bus AC Characteristics

Signal	Description	Minimum	Typical	Maximum	Unit
SCL-freq	I²C clock frequency	100		400	KHz
T-start	Hold time START condition	0.6			µs

Signal	Description	Minimum	Typical	Maximum	Unit
T-stop	Setup time STOP condition	0.6			µs
T-free	Bus free time, STOP to START	1.3			µs
T-high	High period for clock	0.6			µs
T-data-hold	Data hold time	0		0.9	µs
T-data-setup	Data setup time	100			ns

4.5. Auxiliary Serial Link (UART2)

GPS or Bluetooth applications can be interfaced on the auxiliary serial link (UART2).

4.5.1. Pin Description

Refer to the following table for the pin description of the UART2 interface.

Table 18: UART2 Pin Description

Pin Number	Signal	I/O	I/O Type	Reset State	Description	Multiplexed With
24	CT103 / TXD2*	I	1V8	Z	Transmit serial data	GPIO14
23	CT104 / RXD2*	O	1V8	Z	Receive serial data	GPIO15
25	~CT106 / CTS2*	O	1V8	Z	Clear To Send	GPIO16
26	~CT105 / RTS2*	I	1V8	Z	Request To Send	GPIO17

* According to PC view

Refer to section 4.2 Electrical Information for Digital I/O for open drain, 2V8 and 1V8 voltage characteristics and reset state definitions.

The maximum baud rate of UART2 is **920**Kbit/s.

Tip: *The Fastrack Xtend is designed to operate using all serial interface signals and it is mandatory to use RTS2 and CTS2 for hardware flow control in order to avoid data corruption during transmission.*

4.6. RF Interface

This interface allows an MMCX connector to be connected to the Expansion Card and has a 50Ω nominal impedance. Depending on the application used, this can be used for GPS, Bluetooth or other RF devices.

4.6.1. External Active Antenna Specifications

Typically, if active antennas are used (GPS, for example), a DC supply is applied through the RF connector. The table below describes the common characteristics of a GPS external antenna.

Table 19: External Antenna Characteristics

Antenna Frequency Range	1.57542GHz ± 1.023MHz (L1-Band)
Impedance	50Ω nominal
Voltage Supply	3.3V ± 0.5VDC
Gain (antenna + cable)	2dBi (typical)

4.7. Digital Audio Interface (PCM)

The Digital Audio Interface (PCM) interface allows connectivity with standard audio peripherals. It can be used, for example, to connect an external audio codec.

The programmability of this mode allows addressing a large range of audio peripherals.

The signals used by the Digital Audio Interface (PCM) are as follows:

- PCM-SYNC (output): The frame synchronization signal delivers an 8KHz frequency pulse that synchronizes the frame data-IN and the frame data-OUT.
- PCM-CLK (output): The frame bit clock signal controls data transfer with the audio peripheral.
- PCM-OUT (output): The frame “data-OUT” relies on the selected configuration mode.
- PCM-IN (input): The frame “data-IN” relies on the selected configuration mode.

The Digital Audio Interface has the following features:

- IOM-2 compatible device on physical level
- Master mode only with 6 slots by frame, user only on slot 0
- Bit rate single clock mode at 768KHz only
- 16 bits data word MSB first only
- Linear Law only (no compression law)
- Long Frame Synchronization only
- Push-pull configuration on PCM-OUT and PCM-IN

Note that the digital audio interface configuration cannot differ from those specified above.

4.7.1. Waveforms

The following figures describe the PCM Frame and Sampling waveforms.

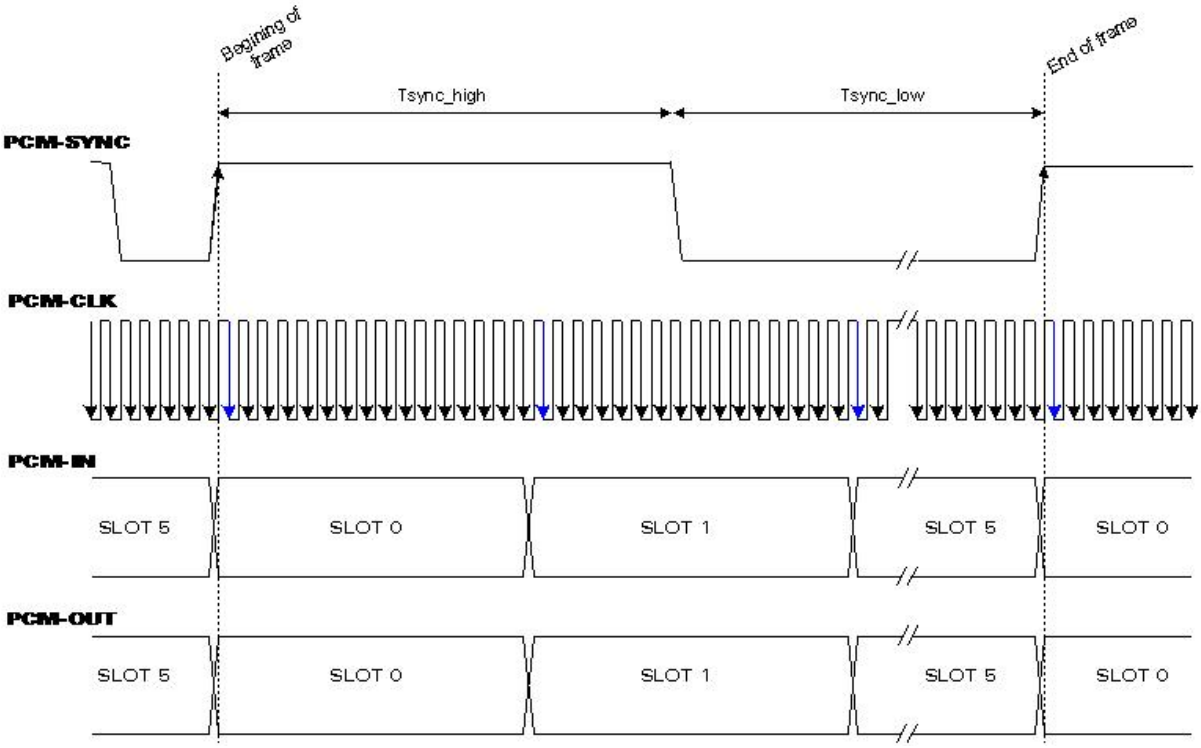


Figure 7. PCM Frame Waveform

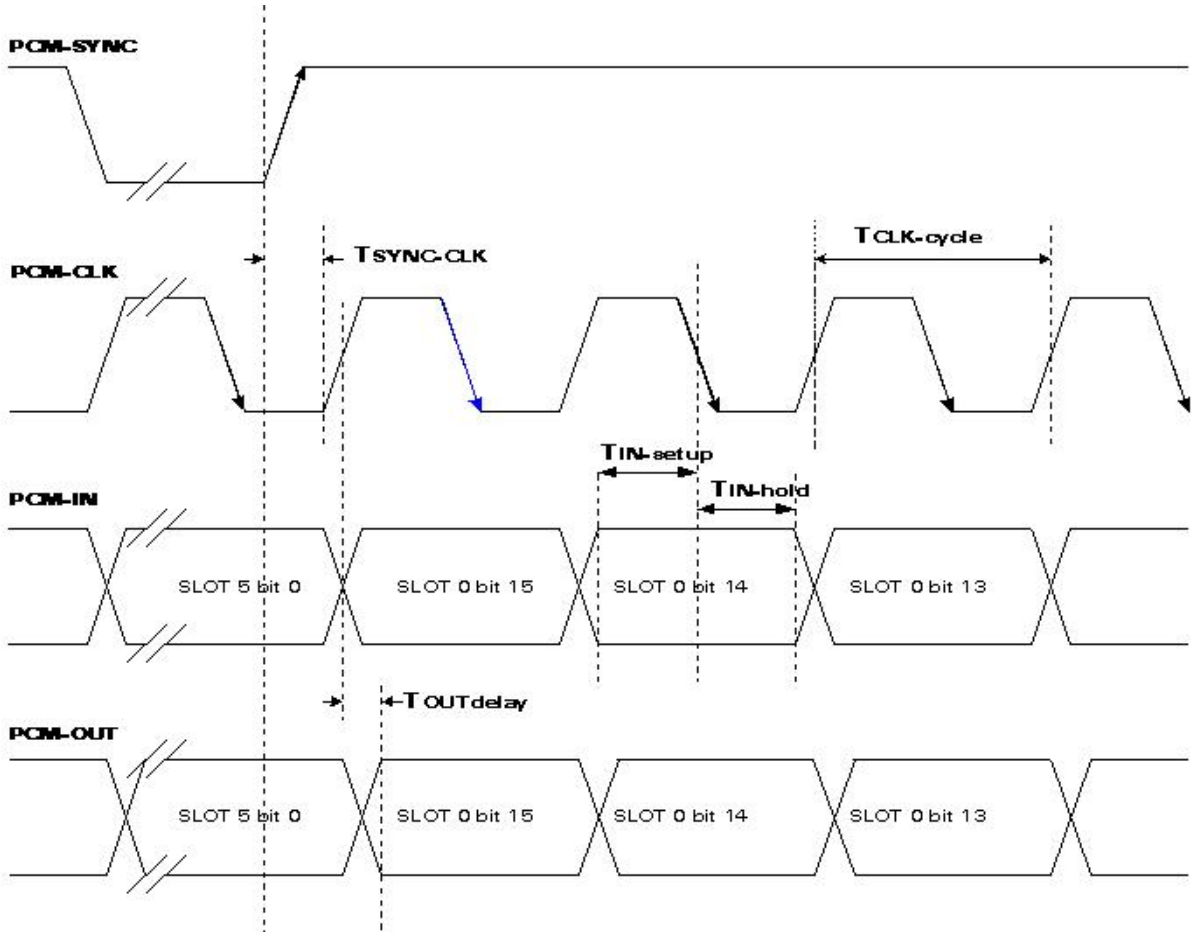


Figure 8. PCM Sampling Waveform

Table 20: PCM AC Characteristics

Signal	Description	Minimum	Typical	Maximum	Unit
Tsync_low + Tsync_high	PCM-SYNC period		125		µs
Tsync_low	PCM-SYNC low time		93		µs
Tsync_high	PCM-SYNC high time		32		µs
TSYNC-CLK	PCM-SYNC to PCM-CLK time		-154		ns
TCLK-cycle	PCM-CLK period		1302		ns
TIN-setup	PCM-IN setup time	50			ns
TIN-hold	PCM-IN hold time	50			ns
TOUT-delay	PCM-OUT delay time			20	ns

4.7.2. Pin Description

Refer to the following table for the pin description of the PCM interface.

Table 21: PCM Pin Description

Pin Number	Signal	I/O	I/O Type	Reset State	Description
36	PCM-SYNC	O	1V8	Pull-down	Frame synchronization 8Khz
38	PCM-CLK	O	1V8	Pull-down	Data clock
39	PCM-OUT	O	1V8	Pull-up	Data output
37	PCM-IN	I	1V8	Pull-up	Data input

Refer to section 4.2 Electrical Information for Digital I/O for open drain, 2V8 and 1V8 voltage characteristics and reset state definitions.

5. Signals and Indicators

5.1. Reset Signal (~RESET)

This pin is tied to the internal reset pin of the Fastrack Xtend. It is used to force a reset procedure by providing the Expansion Card with a LOW level for at least 200µs. This signal must be considered as an emergency reset only. A reset procedure is already driven by the internal hardware during the power-up sequence.

This signal may also be used to provide a reset to an external device (at power-ON only). If no external reset is necessary, this input may be left open. If used (emergency reset), it must be driven either by an open collector or an open drain.

The Expansion Card remains in reset mode as long as the ~RESET signal is held LOW.

Note that an operating system reset is preferred to a hardware reset.

Caution: *This signal should only be used for "emergency" resets.*

5.1.1. Reset Sequence

To activate the "emergency" reset sequence, the ~RESET signal has to be set to LOW for a minimum of 200µs. As soon as the reset is completed, the AT interface answers the application with an "OK".

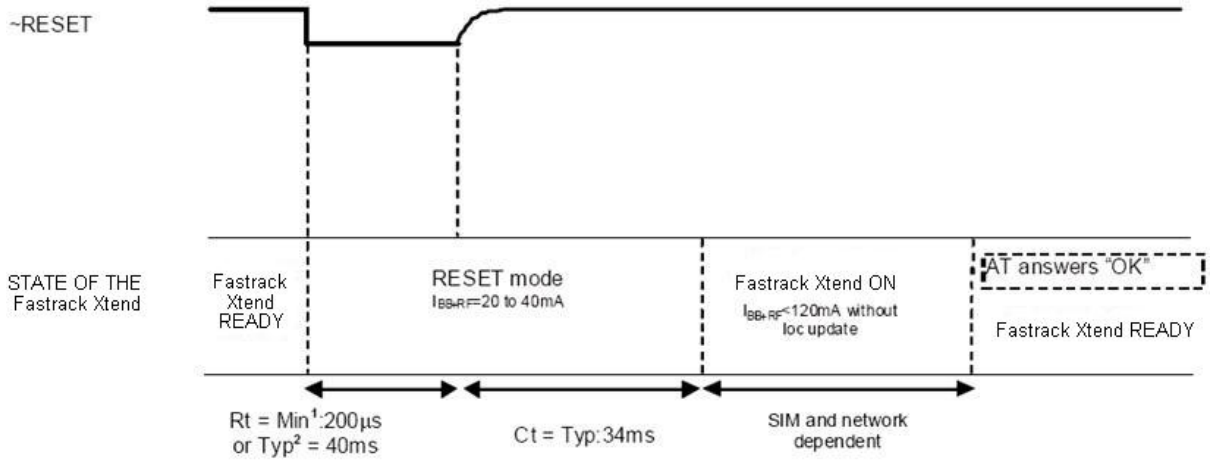


Figure 9. Reset Sequence Waveform

At power-up, the ~RESET time (Rt) is carried out after switching the Fastrack Xtend ON. It is generated by the internal voltage supervisor.

The ~RESET time is provided by the internal RC component. To keep the same time, it is not recommended to connect another R or C component (resistor or capacitor) on the ~RESET signal. Only a switch or an open drain gate is recommended.

Ct is the cancellation time required for Fastrack Xtend initialization. Ct is automatically carried out after hardware reset.

5.1.2. Pin Description

Refer to the following table for the pin description of the reset signal.

Table 22: Reset Signal Pin Description

Pin Number	Signal	I/O	I/O Type	Description
13	~RESET	I/O Open Drain	1V8	Fastrack Xtend Reset

Refer to section 4.2 Electrical Information for Digital I/O for open drain, 2V8 and 1V8 voltage characteristics and reset state definitions.

5.1.3. Electrical Characteristics

Refer to the following table for the electrical characteristics of the reset signal.

Table 23: Electrical Characteristics of the Reset Signal

Parameter	Minimum	Typical	Maximum	Unit
Input Impedance (R)*		330K		Ω
Input Impedance (C)		10n		F
~RESET time (Rt)[1]	200			µs
~RESET time (Rt)[2] at power up only	20	40	100	ms
Cancellation time (Ct)		34		ms
V_H	0.57			V
V_{IL}	0		0.57	V
V_{IH}	1.33			V

* Internal pull-up

* V_H: Hysterisis Voltage

1 This reset time is the minimum to be carried out on the ~RESET signal when the power supply is already stabilized.

2 This reset time is internally carried out by the Fastrack Xtend power supply supervisor only when the power supplies are powered ON.

5.2. BOOT Signal

A specific BOOT control pin is for downloading firmware to the Fastrack Xtend.

A specific PC software program, provided by Sierra Wireless, is needed to perform this specific download.

The BOOT pin must be connected to VCC_1V8 for this specific download.

Table 24: BOOT Settings

BOOT	Operating Mode	Comment
Leave open	Normal use	No download
Leave open	Download XMODEM	AT command for Download **AT+WDWL***
1	Download specific	Need Sierra Wireless PC software

* Refer to document [10] Firmware 7.4a AT Commands Manual (Sierra Wireless Software Suite 2.31)/Firmware 7.4 AT Commands Manual (Sierra Wireless Software Suite 2.30) for more information about this command.

5.2.1. Pin Description

Refer to the following table for the pin description of the BOOT signal.

Table 25: Boot Signal Pin Description

Pin Number	Signal	I/O	I/O Type	Description
12	BOOT	I	1V8	Download mode selection

Refer to section 4.2 Electrical Information for Digital I/O for open drain, 2V8 and 1V8 voltage characteristics and reset state definitions.

For more information about using AT Commands to manipulate this signal, refer to document [12] AT Commands Interface Guide.

Note that this BOOT signal must be left open for normal use or XMODEM download.

5.3. External Interrupt

The Expansion Card provides one external interrupt input. This interrupt input can be activated on the:

- High to low level transition
- Low to high level transition
- Low to high and high to low level transitions

When used, the interrupt input must not be left open; when not used, this signal must be configured as a GPIO.

5.3.1. Pin Description

Refer to the following table for the pin description of the external interrupt.

Table 26: External Interrupt Pin Description

Pin Number	Signal	I/O	I/O Type	Reset State	Description	Multiplexed With
32	INT0	I	1V8	Z	External Interrupt	GPIO3

Refer to section 4.2 Electrical Information for Digital I/O for open drain, 2V8 and 1V8 voltage characteristics and reset state definitions.

5.3.2. Electrical Characteristics

Refer to the following table for the electrical characteristics of the external interrupt.

Table 27: Electrical Characteristics of the External Interrupt

Parameter		Minimum	Maximum	Unit
INT0	V_{IL}		0.54	V
	V_{IH}	1.33		V

5.4. GSM-2V8 and GSM-1V8 Output

These outputs must be used as reference or as a pull-up resistor supplies only. The voltage supplies are available when the Fastrack Xtend is ON.

5.4.1. Pin Description

Refer to the following table for the pin description of the GSM-2V8 and GSM-1V8 output.

Table 28: GSM-2V8 and GSM-1V8 Output Pin Description

Pin Number	Signal	I/O	I/O Type	Description
11	GSM-2V8	O	Supply	Digital supply
10	GSM-1V8	O	Supply	Digital supply

5.4.2. Electrical Characteristics

Refer to the following table for the electrical characteristics of the GSM-2V8 and GSM-1V8 output.

Table 29: Electrical Characteristics of GSM-2V8 and GSM-1V8 Output

Parameter		Minimum	Typical	Maximum	Unit
GSM-2V8	Output voltage	2.74	2.8	2.86	V
	Output current			15	mA
GSM-1V8	Output voltage	1.76	1.8	1.94	V
	Output current			15	mA

5.5. Analog to Digital Converter

One Analog to Digital Converter input is available from the Expansion Card. The converter is a 10-bit resolution ADC ranging from 0 to 2V.

5.5.1. Pin Description

Refer to the following table for the pin description of the analog to digital converter.

Table 30: Analog to Digital Pin Description

Pin Number	Signal	I/O	I/O Type	Description
14	AUX-ADC	I	Analog	A/D converter

5.5.2. Electrical Characteristics

Refer to the following table for the electrical characteristics of the analog to digital converter.

Table 31: Electrical Characteristics of the Analog to Digital Converter

Parameter		Minimum	Typical	Maximum	Unit
Resolution			10		bits
Sampling rate				138*	sps
Input signal range		0		2	V
INL (Integral non linearity)			15		mV
DNL (Differential non linearity)			2.5		mV
Input impedance	AUX-ADC		1M		Ω

* Sampling rate only for AUX-ADC and Sierra Wireless Software Suite application

5.6. Digital to Analog Converter

One Digital to Analog Converter output is available from the Expansion Card. The converter is an 8-bit resolution DAC ranging from 0 to 2V.

5.6.1. Pin Description

Refer to the following table for the pin description of the digital to analog converter.

Table 32: Digital to Analog Pin Description

Pin Number	Signal	I/O	I/O Type	Description
40	AUX-DAC	O	Analog	D/A converter

Note: This output assumes a typical external load of 2kΩ and 50pF in parallel to GND.

5.6.2. Electrical Characteristics

Refer to the following table for the electrical characteristics of the digital to analog converter.

Table 33: Electrical Characteristics of the Digital to Analog Converter

Parameter	Minimum	Typical	Maximum	Unit
Resolution		8		bits
Output signal range	0		2.3	V
Output voltage after reset		1.147		V
INL (Integral non linearity)	-5		+5	LSB
DNL (Differential non linearity)	-1		+1	LSB

6. Reliability Compliance and Recommended Standards

6.1. Reliability Compliance

The Fastrack Xtend is compliant with the following requirements.

Table 34: Standards Conformity for the Fastrack Xtend Series

Abbreviation	Definition
IEC	International Electro technical Commission
ISO	International Organization for Standardization

6.2. Applicable Standards Listing

The table hereafter gives the basic list of standards applicable to the Fastrack Xtend.

Note: References to any features can be found from these standards.

Table 35: Applicable Standards and Requirements for the Fastrack Xtend

Document	Current Version	Title
IEC6006826	7.0	Environmental testing - Part 2.6: Test FC: Sinusoidal Vibration.
IEC60068234	73	Basic environmental testing procedures part 2: Test FD: random vibration wide band - general requirements. Cancelled and replaced by **IEC60068-2-64**. For reference only.
IEC60068264	2.0	Environmental testing - part 2-64: Test FH: vibration, broadband random and guidance.
IEC60068232	2.0	Basic environmental testing procedures - part 2: Test ED: (procedure 1) Withdrawn & replaced by **IEC60068-2-31**. For reference only.
IEC60068231	2.0	Environmental testing part 2-31: Test EC: rough handling shocks, primarily for equipment-type specimens.
IEC60068229	2.0	Basic environmental testing procedures - part 2: Test EB and guidance: bump. Withdrawn and replaced by **IEC60068-2-27**. For reference only.
IEC60068227	4.0	Environmental testing - part 2-27: Test EA and guidance: shock.
IEC60068214	6.0	Environmental testing - part 2-14: Test N: change of temperature.
IEC6006822	5.0	Environmental testing - part 2-2: Test B: dry heat.
IEC6006821	6.0	Environmental testing - part 2-1: Test A: cold.
IEC60068230	3.0	Environmental testing - part 2-30: Test DB: damp heat, cyclic (12 h + 12 h cycle).
IEC6006823	69 w/A1	Basic environmental testing procedures part 2: Test CA: damp heat, steady State. Withdrawn and replaced by **IEC60068-2-78**. For reference only.
IEC60068278	1.0	Environmental testing part 2-78: Test CAB: damp heat, steady state.

Document	Current Version	Title
IEC60068238	2.0	Environmental testing - part 2-38: Test Z/AD: composite temperature/humidity cyclic test.
IEC60068240	1.0 w/A1	Basic environmental testing procedures - part 2: Test Z/AM combined cold/low air pressure tests.
ISO167501	2ND	Road vehicles - environmental conditions and testing for electrical and electronic equipment - part 1: general.
ISO167502	2ND	Road vehicles - environmental conditions and testing for electrical and electronic equipment - part 2: electrical loads.
ISO167503	2ND	Road vehicles - environmental conditions and testing for electrical and electronic equipment - part 3: mechanical loads.
ISO167504	2ND	Road vehicles - environmental conditions and testing for electrical and electronic equipment - part 4: climatic loads.
IEC60529	2.1 w/COR2	Degrees of protection provided by enclosures (IP code).
IEC60068217	4.0	Basic environmental testing procedures - part 2: Test Q: sealing.
IEC60068218	2.0	Environmental testing - part 2-18: Tests - R and guidance: water.
IEC60068270	1.0	Environmental testing - part 2: tests - test XB: abrasion of markings and letterings caused by rubbing of fingers and hands.
IEC60068268	1.0	Environmental testing - part 2: tests - test l: dust and sand.
IEC60068211	3.0	Basic environmental testing procedures, part 2: test KA: salt mist.
IEC60068260	2.0	Environmental testing - part 2: Test KE: flowing mixed gas corrosion test.
IEC60068252	2.0 w/COR	Environmental testing - part 2: Test KB: salt mist, cyclic (sodium chloride solution).

6.3. Environmental Specifications

The Fastrack Xtend is compliant with the operating classes listed below. To ensure the proper operation of the Expansion Card, the temperature of the environment must be within the specified range as described in the following tables.

Table 36: Operating Class Temperature Range without an Expansion Card

Conditions	Temperature Range
Operating / Class A	-20 °C to +55°C
Operating / Class B	-30 °C to +75°C
Operating / Class C	-30 °C to +85°C
Storage	-40 °C to +85°C

6.3.1. Function Status Classification

The classes reported below comply with the Annex "ISO Failure Mode Severity Classification", ISO Standard 7637, and Section 1.

Note: The word "function" used here only concerns the function performed by the Fastrack Xtend.

Table 37: ISO Failure Mode Severity Classification

Class	Definition
CLASS A	All equipment/system functions are fulfilled normally (100% functional) during and after the constraint. The Fastrack Xtend and the Expansion Card shall exhibit normal function during and after environmental exposure. The Fastrack Xtend and the Expansion Card performance shall meet the minimum requirements of 3GPP or appropriate wireless standards.
CLASS B	All equipment/system functions are fulfilled normally during application of the constraint; however, one or several of them may be out of the specified tolerances. After application of the constraint, all functions automatically return within standard limits. The memories shall remain in compliance with Class A. The Fastrack Xtend and the Expansion Card shall exhibit the possibility at all times to establish a voice, SMS or DATA call. Unless otherwise stated, full performance should return to normal after the external influence has been removed.
CLASS C	No functional requirement will be fulfilled during the application of the constraint; however, full functionality will automatically be returned after the constraint has been removed.

6.3.2. Reliability Prediction Model

The following tables enumerate the different tests performed on the Fastrack Xtend and their corresponding conditions and results.

6.3.2.1. Life Stress Test

The following tests the Fastrack Xtend's product performance.

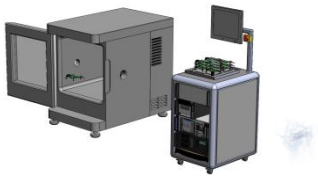
Table 38: Life Stress Test

Designation	Condition
Performance Test PT3T° & PT 	Standard: N/A
	Special conditions: • Temperature: ▪ Class A: -20 °C to +55°C ▪ Class B: -30 °C to +75°C • Rate of temperature change: ± 3°C/min • Recovery time: 3 hours
	Operating conditions: Powered
	Duration: 10 days

6.3.2.2. Environmental Resistance Stress Test

The following tests the Fastrack Xtend's resistance to extreme temperature.

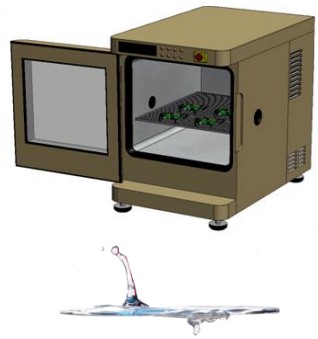
Table 39: Environmental Resistance Stress Test

Designation	Condition
Cold Test COT 	Standard: IEC 680068-2-1, Test Ab
	Special conditions: • Temperature: -40°C • Rate of temperature change: dT/dt >= ± 3°C/min • Recovery time: 3 hours
	Operating conditions: Un-powered
	Duration: 72 hours

6.3.2.3. Corrosive Resistance Stress Test

The following tests the Fastrack Xtend's resistance to corrosive atmosphere.

Table 40: Corrosive Resistance Stress Test

Designation	Condition
Moist Heat Cyclic Test MHCT 	Standard: IEC 60068-2-30, Test Db
	Special conditions: • Upper temperature: +55 ± 2°C • Lower temperature: +25 ± 2°C • RH: ▪ Upper temperature: 93% ▪ Lower temperature: 95% • Number of cycles: 21 (1 cycle/24 hours) • Rate of temperature change: dT/dt >= ± 3°C/min • Recovery time: 3 hours
	Operating conditions: Un-powered
	Duration: 21 days

6.3.2.4. Thermal Resistance Cycle Stress Test

The following tests the Fastrack Xtend's resistance to extreme temperature cycling.

Table 41: Thermal Resistance Cycle Stress Test

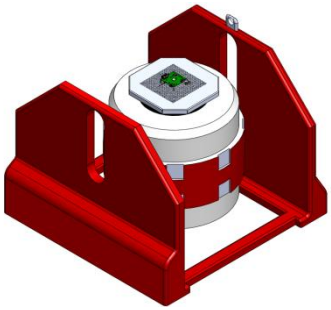
Designation	Condition
Thermal Shock Test TSKT 	Standard: IEC 60068-2-14
	Special conditions: • Upper temperature: +90°C • Lower temperature: -40°C • Rate of temperature change: 30s • Number of cycles: 200 • Duration of exposure: 30 minutes • Recovery time: 3 hours
	Operating conditions: Un-powered
	Duration: 72 hours

6.3.2.5. Mechanical Resistance Stress Tests

The following tests the Fastrack Xtend's resistance to vibrations and mechanical shocks.

Table 42: Mechanical Resistance Stress Tests

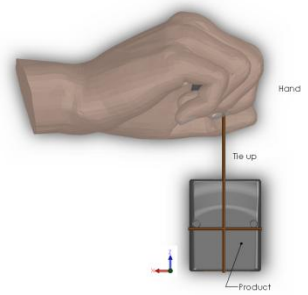
Designation	Condition
Sinusoidal Vibration Test SVT1 	Standard: IEC 60068-2-6, Test Fc
	Special conditions: • Frequency range: 10Hz to 1000Hz ▪ Displacement: ±5mm (peak) • Frequency range: 16Hz to 62Hz ▪ Acceleration: 5G • Frequency range: 62Hz to 200Hz ▪ Acceleration: 3G • Frequency range: 200Hz to 1000Hz ▪ Acceleration: 1G • Sweep rate: 1 oct/min. • Test duration: 20 cycles • Sweep directions: X, Y and Z
	Operating conditions: Un-powered
	Duration: 72 hours
Random Vibration Test	Standard: IEC 60068-2-64

Designation	Condition
RVT 	Special conditions: • Density spectrum: 0.96m^2/s3 • Frequency range: ▪ 0.1 g^2/Hz at 10Hz ▪ 0.01 g^2/Hz at 250Hz ▪ 0.0005 g^2/Hz at 1000Hz ▪ 0.0005 g^2/Hz at 2000Hz • Slope: -3dB/octave • Acceleration: 0.9gRMS • Number of axis: 3
	Operating conditions: Un-powered
	Duration: 16 hours
Mechanical Shock Test MST 	Standard: IEC 60068-2-27, Test Ea
	Special conditions: • Shock Test 1: ▪ Wave form: Half sine ▪ Peak acceleration: 30G ▪ Duration: 11ms ▪ Number of shocks: 8 per direction ▪ Number of directions: 6 (±X, ±Y, ±Z) • Shock Test 2: ▪ Wave form: Half sine ▪ Peak acceleration: 200G ▪ Duration: 3ms ▪ Number of shocks: 3 per direction ▪ Number of directions: 6 (±X, ±Y, ±Z) • Shock Test 3: ▪ Wave form: Half sine ▪ Peak acceleration: 100G ▪ Duration: 6ms ▪ Number of shocks: 3 per direction ▪ Number of directions: 6 (±X, ±Y, ±Z)
	Operating conditions: Un-powered
	Duration: 72 hours

6.3.2.6. Handling Resistance Stress Tests

The following tests the Fastrack Xtend's resistance to handling malfunctions and damage.

Table 43: Handling Resistance Stress Tests

Designation	Condition
ESD Test	Standard: IEC 1000-4-2
	Special conditions: • Contact discharges: 10 positive and 10 negative applied • Voltage: ±2kV, ±4kV, ±6kV
	Operating conditions: Powered
	Duration: 24 hours
Operational Durability OD	Standard: N/A
	Special Conditions: • SIM Connector: ▪ Cycles: 40 ▪ Repetition Rate: 3s per cycle ▪ Objective: Mating and de-mating • System Connector: ▪ Cycles: 40 ▪ Repetition Rate: 3s per cycle ▪ Objective: Mating and de-mating • RF Connector: ▪ Cycles: 20 ▪ Repetition Rate: 5s per cycle ▪ Objective: Mating and de-mating
	Operating conditions: Un-powered
	Duration: 24 hours
Free Fall Test FFT 	Standard : IEC 60068-2-32, Test Ed
	Special conditions: • Drop: 2 samples for each direction • Equivalent drop height: 1.5m • Number of directions: 6 (±X, ±Y, ±Z) • Number of drops/face: 2
	Operating conditions: Un-powered
	Duration:24 hours

7. Certification Compliance and Recommended Standards

7.1. Certification Compliance

The Fastrack Xtend is compliant with the following requirements.

Table 44: Standards Conformity for the Fastrack Xtend Series

Domain	Applicable Standard
Safety standard	EN 60950-1 (ed.2006)
Health standard (EMF Exposure Evaluation)	EN 62311 (ed. 2008)
Efficient use of the radio frequency spectrum	EN 301 511 (V 9.0.2) EN 300 440-2 (V1.2.1) (GPS variant only) EN 301 908-1 (V3.2.1) (3G variants only) EN 301 908-2 (V3.2.1) (3G variants only)
EMC	EN 301 489-1 (v1.8.1) EN 301 489-3 (v1.3.1) (2G variants only) EN 301 489-7 (v1.3.1) EN 301 489-24 (v1.4.1) (3G variants only)
FCC	FCC Part 15 FCC Part 22, 24
IC	RSS-132 Issue 2 RSS-133 Issue 5
International Standard for Battery	IEC 61951-2

7.2. Applicable Standards Listing

The table hereafter gives the basic list of standards applicable for 2G and WCDMA (Rel. 5 to 7).

Note: References to any features can be found from these standards.

Table 45: Applicable Standards and Requirements for the Fastrack Xtend Series

Document	Current Version	Title
GCF	3.7.1	GSM Certification Forum - Certification Criteria
NAPRD.03	2.6.0	Overview of PCS Type certification review board (PTCRB) Mobile Equipment Type Certification and IMEI control
TS 51.010-1	8.3.0	3rd Generation Partnership Project; Technical Specification Group GSM/EDGE Radio Access Network; Digital cellular telecommunications system (Phase 2+); Mobile Station (MS) conformance specification; Part 1: Conformance specification
TS 51.010-2	8.3.0	3rd Generation Partnership Project; Technical Specification Group GSM/EDGE Radio Access Network; Mobile Station (MS) conformance specification; Part 2: Protocol Implementation Conformance Statement (PICS) proforma specification

Document	Current Version	Title
TS 51.010-4	4.14.1	3rd Generation Partnership Project; Technical Specification Group GSM/EDGE Radio Access Network; Digital cellular telecommunications system (Phase 2+); Mobile Station (MS) conformance specification; Part 4: SIM Application Toolkit Conformance specification
EN 301 511	9.0.2	Global System for Mobile Communications (GSM); Harmonised standard for mobile stations in the GSM 900 and DCS 1800 bands covering essential requirements under article 3.2 of the R&TTE directive (1999/5/EC)
TS 34.121-1	8.5.0	3rd Generation Partnership Project; Technical Specification Group Radio Access Network; User Equipment (UE) conformance specification; Radio transmission and reception (FDD); Part 1: Conformance specification **(for 3G variants only)**
TS 34.121-2	8.5.0	3rd Generation Partnership Project; Technical Specification Group Radio Access Network User Equipment (UE) conformance specification; Radio transmission and reception (FDD); Part 2: Implementation Conformance Statement (ICS) **(for 3G variants only)**
EN 301 908-1	3.2.1	Electromagnetic compatibility and Radio spectrum Matters (ERM); Base Stations (BS), Repeaters and User Equipment (UE) for IMT-2000 Third-Generation cellular networks; Part 1: Harmonized EN for IMT-2000, introduction and common requirements, covering essential requirements of article 3.2 of the R&TTE Directive **(for 3G variants only)**
EN 301 908-2	3.2.1	Electromagnetic compatibility and Radio spectrum Matters (ERM); Base Stations (BS), Repeaters and User Equipment (UE) for IMT-2000 Third-Generation cellular networks; Part 2: Harmonized EN for IMT-2000, CDMA Direct Spread (UTRA FDD) (UE) covering essential requirements of article 3.2 of the R&TTE Directive **(for 3G variants only)**

8. Design Guidelines

8.1. EMC Recommendations

EMC tests must be performed on the application as soon as possible to detect any potential problems.

When designing, special attention should be paid to:

- Possible spurious emission radiated by the application to the RF receiver in the receiver band
- ESD protection is mandatory on all signals which are externally accessible. Typically, ESD protection is mandatory for an IO Expander Connector.
- Ground plane: Sierra Wireless recommends a common ground plane for analog/digital/RF grounds and the IESM board must be properly grounded with Fastrack Xtend metallic housing.

Tip: *In order for the Expansion Card to have the best grounding, Sierra Wireless recommends attaching the ground plane of the PCB to the back plate instead of on the Fastrack Xtend's main housing. Expansion Cards designed by Sierra Wireless achieves this by using a metallic spring that attaches to the middle screw of the back plate.*

9. Connector and Peripheral Device References

This section contains a list of recommended manufacturers or suppliers for the peripheral devices to be used with the Expansion Card.

For more information, refer to the following websites:

- Kyocera Elco: http://www.kyocera-elco.com/
- Hirose: http://www.hirose.com/
- AVX Corp: http://www.avx.com/
- Amphenol: http://www.amphenol.com

9.1. General Purpose Connector

The recommended 50-pin plug connector (Expansion Card side) has a 0.5mm pitch from Kyocera Elco with the following reference:

- 14 5078 050 515 861+

The recommended 50-pin connector mating connector (Fastrack Xtend side) is from Kyocera Elco with the following reference:

- 24 5078 050 513 861+

10. Reference Documents

For more details, several reference documents can be consulted. The Sierra Wireless documents referenced herein are provided in the Sierra Wireless documentation package; however, the general reference documents which are not Sierra Wireless owned are not provided in the documentation package.

10.1. Fastrack Xtend and Expansion Card Documents

[1] AirLink FXT Series User Guide

Reference: WA_DEV_FEX20_UGD_002

[2] FXTE01 and FXTE02 User Guide

Reference: WA_DEV_FEX20_UGD_008

[3] FXTE01 and FXTE02 Installation Guide

Reference: WA_DEV_FEX20_UGD_009

10.2. Sierra Wireless Software Suite Documents

[4] Getting started with SDK 4.22b

Reference: WM_DEV_OAT_UGD_048

[5] Tutorial for IDE 1.08 (if using IDE; obsolete if using Developer Studio)

Reference: WM_DEV_OAT_UGD_044

[6] Tools Manual for IDE (if using IDE; obsolete if using Developer Studio)

Reference: WM_DEV_OAT_UGD_045

[7] Basic Development Guide for SDK 4.22 (if using IDE; obsolete if using Developer Studio)

Reference: WM_DEV_OAT_UGD_050

[8] ADL User Guide for SDK 4.22 (if using IDE; obsolete if using Developer Studio)

Reference: WM_DEV_OAT_UGD_051

[9] SDK 4.22 Official Release Note

Reference: WM_DEV_OAT_DVD_338

10.3. Firmware Documents

[10] Firmware 7.4a AT Commands Manual (Sierra Wireless Software Suite 2.31)/Firmware 7.4 AT Commands Manual (Sierra Wireless Software Suite 2.30)

Reference: WM_DEV_OAT_UGD_079 (Version 12 and 11)

[11] Firmware 7.4 Customer Release Note

Reference: WA_PGM_OASIS_CRN_009

[12] AT Commands Interface Guide

Reference: WM_ASW_OAT_UGD_00004

10.4. Plug-In Documents

[13] Opus | C-GPS Application Note
Reference: WM_DEV_C-GPS_APN_001

[14] C-GPS Development Kit User Guide
Reference: WM_DEV_C-GPS_UGD_001

[15] e-Ride Datasheet for Prelude and Opus 1
Reference: WM_DEV_C-GPS_UGD_002

[16] e-Ride GPS Core Interface Rev 1.16.01
Reference: WM_DEV_C-GPS_IFS_003

10.5. General Reference Documents

[17] "I^2C Bus Specification", Version 2.0, Philips Semiconductor 1998

[18] ISO 7816- Standard

11. List of Abbreviations

Abbreviation	Definition
AC	Alternative Current
ADC	Analog to Digital Converter
A/D	Analog to Digital conversion
AF	Audio-Frequency
AT	ATtention (prefix for modem commands)
AUX	AUXiliary
CAN	Controller Area Network
CB	Cell Broadcast
CEP	Circular Error Probable
CLK	CLocK
CMOS	Complementary Metal Oxide Semiconductor
CS	Coding Scheme
CTS	Clear To Send
DAC	Digital to Analogue Converter
dB	Decibel
DC	Direct Current
DCD	Data Carrier Detect
DCE	Data Communication Equipment
DCS	Digital Cellular System
DR	Dynamic Range
DSR	Data Set Ready
DTE	Data Terminal Equipment
DTR	Data Terminal Ready
EDGE	Enhance Data rates for GSM Evolution
EFR	Enhanced Full Rate
E-GSM	Extended GSM
EGPRS	Enhance GPRS
EMC	ElectroMagnetic Compatibility
EMI	ElectroMagnetic Interference
EMS	Enhanced Message Service
EN	ENable
ESD	ElectroStatic Discharges
FIFO	First In First Out
FR	Full Rate
FTA	Full Type Approval
GND	GrouND
GPI	General Purpose Input
GPC	General Purpose Connector
GPIO	General Purpose Input Output
GPO	General Purpose Output

Abbreviation	Definition
GPRS	General Packet Radio Service
GPS	Global Positioning System
GSM	Global System for Mobile communications
HR	Half Rate
I/O	Input / Output
LED	Light Emitting Diode
LNA	Low Noise Amplifier
MAX	MAXimum
MIC	MICrophone
MIN	MINimum
MMS	Multimedia Message Service
MO	Mobile Originated
MT	Mobile Terminated
na	Not Applicable
NF	Noise Factor
NMEA	National Marine Electronics Association
NOM	NOMinal
NTC	Negative Temperature Coefficient
PA	Power Amplifier
Pa	Pascal (for speaker sound pressure measurements)
PBCCH	Packet Broadcast Control CHannel
PC	Personal Computer
PCB	Printed Circuit Board
PDA	Personal Digital Assistant
PFM	Power Frequency Modulation
PSM	Phase Shift Modulation
PWM	Pulse Width Modulation
RAM	Random Access Memory
RF	Radio Frequency
RFI	Radio Frequency Interference
RHCP	Right Hand Circular Polarization
RI	Ring Indicator
RST	ReSeT
RTC	Real Time Clock
RTCM	Radio Technical Commission for Maritime services
RTS	Request To Send
RX	Receive
SCL	Serial CLock
SDA	Serial DAta
SIM	Subscriber Identification Wireless CPU®
SMS	Short Message Service
SPI	Serial Peripheral Interface
SPL	Sound Pressure Level

Abbreviation	Definition
SPK	SPeaKer
SRAM	Static RAM
TBC	To Be Confirmed
TDMA	Time Division Multiple Access
TP	Test Point
TVS	Transient Voltage Suppressor
TX	Transmit
TYP	TYPical
UART	Universal Asynchronous Receiver-Transmitter
USB	Universal Serial Bus
USSD	Unstructured Supplementary Services Data
VSWR	Voltage Standing Wave Ratio

12. Safety Recommendations (For Information Only)

For the efficient and safe operation of your GSM application, please read this information carefully.

12.1. RF Safety

12.1.1. General

Your GSM terminal is based on the GSM standard for cellular technology. The GSM standard is spread all over the world. It covers Europe, Asia and some parts of America and Africa. This is the most used telecommunication standard.

Your GSM terminal is actually a low power radio transmitter and receiver. It sends out as well as receives radio frequency energy. When you use your GSM application, the cellular system which handles your calls controls both the radio frequency and the power level of your cellular modem.

12.1.2. Exposure to RF Energy

There has been some public concern about possible health effects of using GSM terminals. Although research on health effects from RF energy has focused on the current RF technology for many years, scientists have begun research regarding newer radio technologies, such as GSM. After existing research had been reviewed, and after compliance to all applicable safety standards had been tested, it has been concluded that the product was fitted for use.

If you are concerned about exposure to RF energy, there are things you can do to minimize exposure. Obviously, limiting the duration of your calls will reduce your exposure to RF energy. In addition, you can reduce RF exposure by operating your cellular terminal efficiently by following the guidelines below.

12.1.3. Efficient Terminal Operation

For your GSM terminal to operate at the lowest power level, consistent with satisfactory call quality:

If your terminal has an extendable antenna, extend it fully. Some models allow you to place a call with the antenna retracted. However your GSM terminal operates more efficiently with the antenna when it is fully extended.

Do not hold the antenna when the terminal is "IN USE". Holding the antenna affects call quality and may cause the modem to operate at a higher power level than needed.

12.1.4. Antenna Care and Replacement

Do not use the GSM terminal with a damaged antenna. If a damaged antenna comes into contact with the skin, a minor burn may result. Replace a damaged antenna immediately. You may repair antenna to yourself by following the instructions provided to you. If so, use only a manufacturer-approved antenna. Otherwise, have your antenna repaired by a qualified technician.

Buy or replace the antenna only from the approved suppliers list. Using unauthorized antennas, modifications or attachments could damage the terminal and may contravene local RF emission regulations or invalidate type approval.

12.2. General Safety

12.2.1. Driving

Check the laws and the regulations regarding the use of cellular devices in the area where you have to drive as you always have to comply with them. When using your GSM terminal while driving, please:

- give full attention to driving,
- pull off the road and park before making or answering a call if driving conditions so require.

12.2.2. Electronic Devices

Most electronic equipment, for example in hospitals and motor vehicles is shielded from RF energy. However, RF energy may affect some improperly shielded electronic equipment.

12.2.3. Vehicle Electronic Equipment

Check with your vehicle manufacturer representative to determine if any on-board electronic equipment is adequately shielded from RF energy.

12.2.4. Medical Electronic Equipment

Consult the manufacturer of any personal medical devices (such as pacemakers, hearing aids, etc...) to determine if they are adequately shielded from external RF energy.

Turn your terminal **OFF** in health care facilities when any regulations posted in the area instruct you to do so. Hospitals or health care facilities may be using RF monitoring equipment.

12.2.5. Aircraft

Turn your terminal OFF before boarding any aircraft.

- Use it on the ground only with crew permission.
- Do not use it in the air.

To prevent possible interference with aircraft systems, Federal Aviation Administration (FAA) regulations require you should have prior permission from a crew member to use your terminal while the aircraft is on the ground. To prevent interference with cellular systems, local RF regulations prohibit using your modem while airborne.

12.2.6. Children

Do not allow children to play with your GSM terminal. It is not a toy. Children could hurt themselves or others (by poking themselves or others in the eye with the antenna, for example). Children could damage the modem, or make calls that increase your modem bills.

12.2.7. Blasting Areas

To avoid interfering with blasting operations, turn your unit OFF when you are in a "blasting area" or in areas posted: "turn off two-way radio". Construction crew often uses remote control RF devices to set off explosives.

12.2.8. Potentially Explosive Atmospheres

Turn your terminal **OFF** when in any area with a potentially explosive atmosphere. Though it is rare, but your modem or its accessories could generate sparks. Sparks in such areas could cause an explosion or fire resulting in bodily injuries or even death.

Areas with a potentially explosive atmosphere are often, but not always, clearly marked. They include fuelling areas such as petrol stations; below decks on boats; fuel or chemical transfer or storage facilities; and areas where the air contains chemicals or particles, such as grain, dust, or metal powders.

Do not transport or store flammable gas, liquid, or explosives, in the compartment of your vehicle which contains your terminal or accessories.

Before using your terminal in a vehicle powered by liquefied petroleum gas (such as propane or butane) ensure that the vehicle complies with the relevant fire and safety regulations of the country in which the vehicle is used.

13. Appendix

13.1. Backplate Reference

There are two types of backplates available to suit different Expansion Card usage and type of connectors used. Refer to the following table for the list of available backplates and the connector openings that they support.

Table 46: Available Backplates

Backplate Type	Sierra Wireless Code	MMCX	LED	16-pin IO Connector	10-pin IO Connector
Type 1	WM24097	✓	✓	✓	X
Type 2	WM24562	X	✓	X	✓

Refer to the following diagrams for the mechanical specifications of both backplate types.

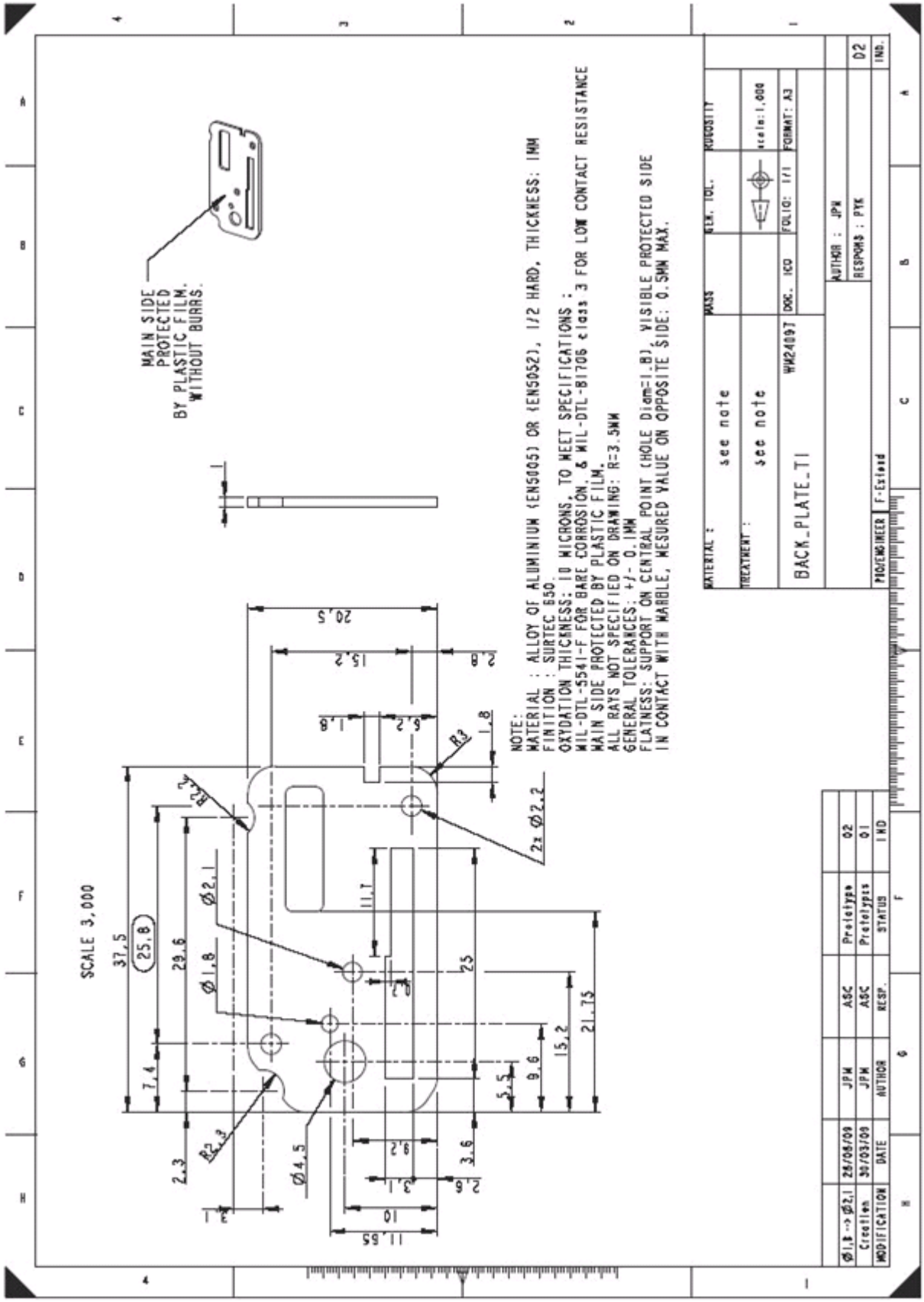


Figure 10. WM24097 Backplate Mechanical Drawing

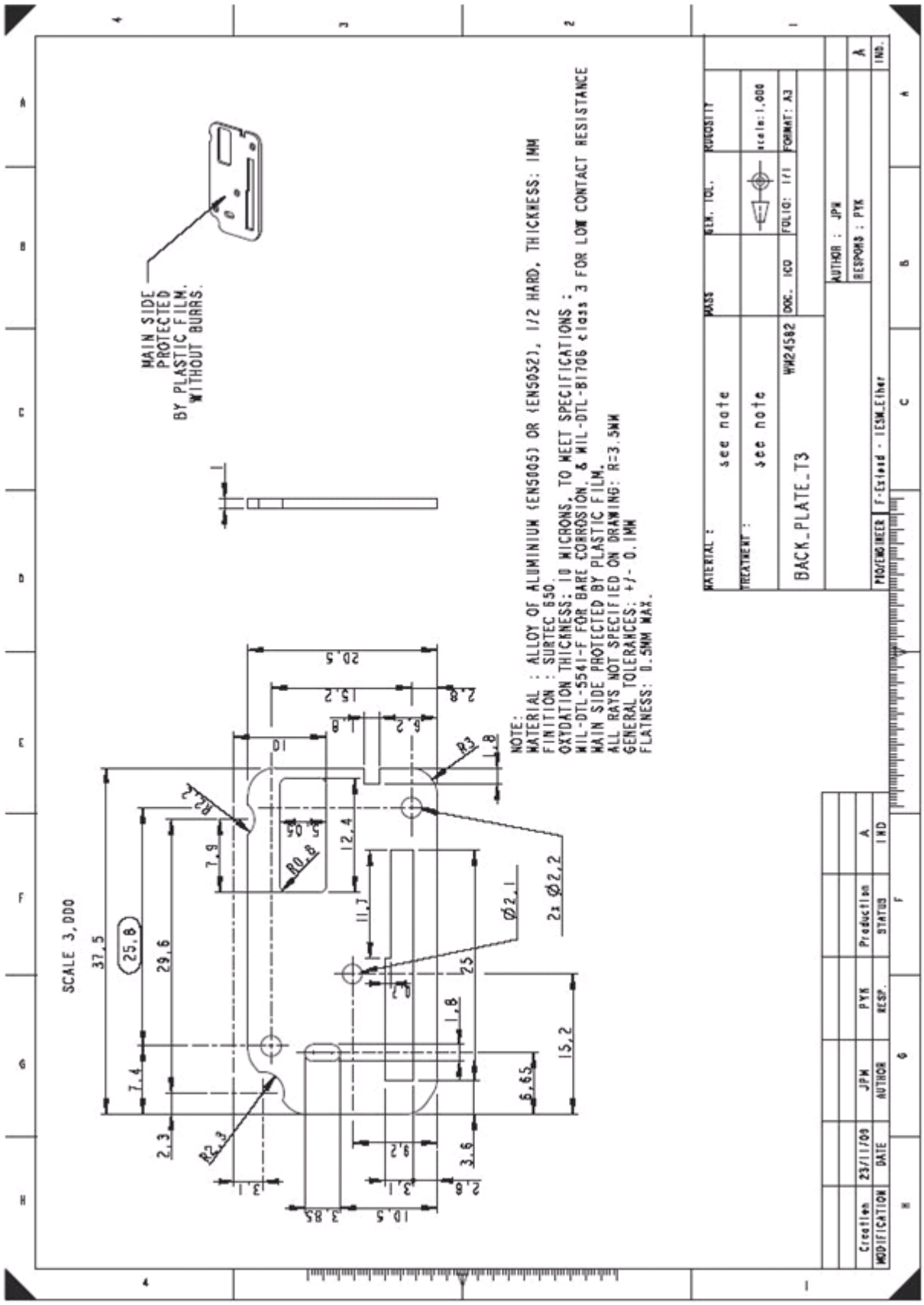


Figure 11. WM24562 Backplate Mechanical Drawing

13.2. Extraction Tool Reference

Refer to the following diagram for more information regarding the extraction tool which is used to remove the Expansion Card from the Fastrack Xtend.

Note: An oval hole is required on the Expansion Card with dimension 1x2.2mm. For details on the position of this oval hole, refer to section 3.2.1 Expansion Card Mechanical Drawing.

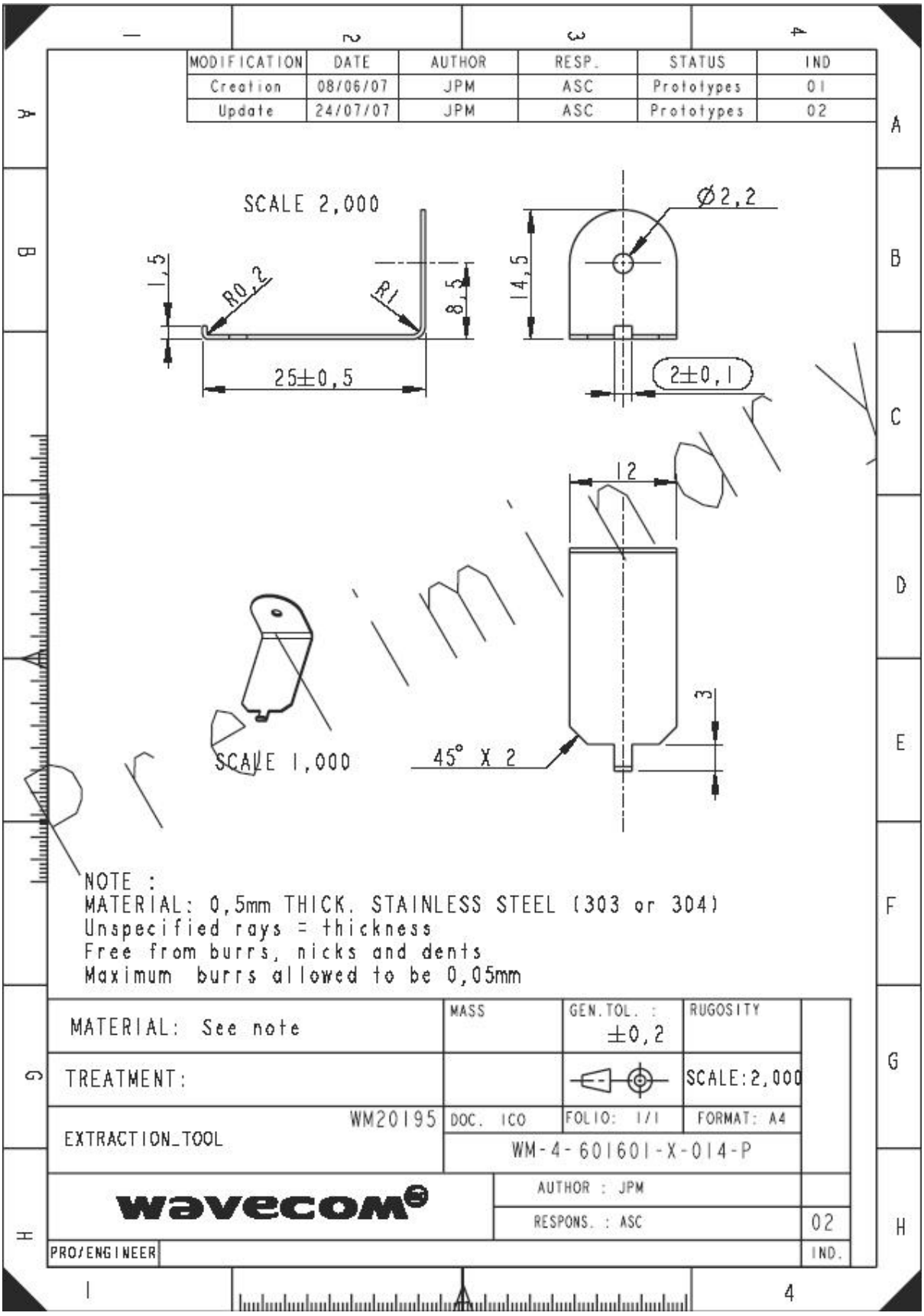


Figure 12. Extraction Tool Mechanical Specifications

SIERRA
WIRELESS